

# MODERN PHOTOGRAPHY

**Too-Hot-to-Handle  
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Questions Answered**

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Creatively**

**How Much Light  
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**At Last! Tiny  
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Pentax cameras have long been renowned for their "human engineering," a unique blend of superb design and placement of controls that gives these cameras an almost uncanny feel and balance.

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You'll find even more expressions of human engineering in the K series camera body design. The edges have been beveled to make them more



# When you're ready for an electronic camera that can be operated fully automatic or fully manual: The Asahi Pentax K2

If you're ready for an automatic 35mm camera, your next camera ought to be the smallest, most compact, most flexible electronic SLR camera available: the amazing Asahi Pentax K2.

The K2 not only is smaller and lighter than any other electronic camera now available, it has a new, exclusive 5-bladed titanium shutter — developed in conjunction with the famous watchmaker, Seiko — that allows lightning-fast re-

sponse in shutter speeds and flash synchronization of 1/125 sec.

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New viewfinder allows a remarkable 95% full field of view

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comfortable. You'll notice that the self-timer is smaller and placed out of the way to give you more gripping room. A new plastic thumbguard makes the film advance lever even more comfortable. The focusing ring on every Pentax lens has been given new knurling and a softer, rubber ring for no-slip gripping. And new synchro plugs accept screw-in cords to hold the flash more securely and to help prevent flash failure.

Small changes? Perhaps. But when you add them to classic Pentax craftsmanship, they add up to cameras that are more human, more responsive, more a part of you. And that serve as a better catalyst for your creativity. The K series: cameras that understand you.

## Your next lens

With the addition of the new Pentax bayonet-mount cameras, Honeywell



# When you're ready for a camera whose viewfinder tells all: The Asahi Pentax KX.

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that coats even the glass surfaces which are not exposed to air, to help you achieve even better photos, even brighter and truer colors.

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viewing even at  
small apertures.

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## THIS MONTH'S COVER . . .

Viewing the world through the rather confining outline of a window frame is nothing new for Michael de Camp. A similar view, you may remember, appeared on our cover a year ago. This time, de Camp, of Image Bank, tacked red and black cloths across the top to modify the restrictive rectangular frame. His exposure, on Kodachrome 25, was made at f/16 and 1/60 sec. with a Nikon FTn and 24mm f/2.8 Nikkor wide-angle lens.

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# letters to the editor

### From the clerk's shoes

As one of the "nervous salesmen" who has been on both sides of the counter in his lifetime, it was with mixed emotions that I read "What to Check Before You Buy Any Camera!" in the Dec. 1975 issue (pg. 12). I wish to heaven that you had put that statement about approaching a civilized store *at other than peak traffic period* in italics. At off hours, a salesman can indeed spend more time with a customer than when there are several dozen people waiting for service. Yet you'd be surprised at the number of people who feel they own a salesman once they walk into a store.

How does a novice distinguish a low-level "functional clatter" that is normal from one that is not? How does it differ from the low-pitched knocking noise?

Many stores do not have more than one model of a particular camera on display. So a salesman must unbox another two cameras for the customer to examine which, aside from taking time, now necessitates that the cameras be classified as "demonstrators." The vast majority of camera purchasers, after thoroughly examining a camera for every possible defect, will still request an unopened, boxed camera because of its alleged purity—never having been subjected to anyone else's touch. Human nature is a funny thing.

Phoenix, Ariz.

Philip L. Harrison

### Definable delights

As an Alpha 11el owner I'm unable to refrain from commenting on the Alpha critique in your *Photo Buying Guide for 1976*. The Alpha is, as you say, idiosyncratic. One of its idiosyncrasies is an indefinable "feel" that makes it a joy to handle. Metering with it is a slightly slower operation than with many SLR's and possibly, if I may quote from your report on the Leica M-5, "seems designed for a (more) deliberate, meticulous personality." It's interesting how similar operations were described as "cumbersome" on the Alpha but "deliberate" in the report on the Leica.

I solved the problem of the focusing ring of the Macro-Switar extending below the camera body by buying a "rationelle" head for my Gitzo tripod. As an eyeglass wearer, I solved the problem of not being able to see the corners of the focusing screen by having the camera supplied with a reduction eyepiece, rather than the standard one.

### Roll 'em, again

I was sorry to read about the demise of Kodak's Teenage Movie Awards in the Nov. 1975 "What's What" (pg. 51), but there is another outlet for some of these amateur films.

Screenscope, an award-winning, educa-

tional film production and distribution company, is currently looking for outstanding films for its many clients. Specifically, we are looking for educational films and films suitable for small children. Any such moviemakers can contact us at 1022 Wilson Blvd., Arlington, Va. 22209.

Michael L. Hartogs

### By the layers

The article entitled "Multicoating: Asset or Gimmick?" (June 1975, pg. 90) is the most excellent of all articles on multicoating. However, we found a mistake in your comments on Minolta which we would like to correct. More than 15 years ago, we developed, as a pioneer, double-layer coatings for photographic lenses, and we have been applying them ever since on most of our lenses. Now, in addition to conventional single-layer coatings and double-layer coatings, we apply a new multicoating which consists basically of four layers but with more complicated layer construction. We do not intend to stick to that number of layers, but we would like to disagree with your opinion that Minolta does not advertise multicoating because it uses only double- or triple-layer coatings.

Indeed, Minolta does not especially indicate which lenses are multicoated by giving them a special name or mark. In short, we agree with the opinion expressed in your article. We are afraid it might make photographers put the cart before the horse if we also gave exaggerated impressions through a new name or model designation.

We give the well-known name "Achromatic Coating" to our own multicoatings as well as to our conventional coatings. We have not changed the name "Rokkor (Rokkor-X)" though these lenses have been improved very much, and we've kept the name "Achromatic Coating" even if new technology is added. Though our progress has often been gradual, we have always applied new technology to both our lens construction and our coatings, and have always improved them for the users' benefit.

Minolta Camera Co.

T. Ogura

Osaka, Japan

### 1975 Index Available

A condensed version of MODERN'S 1975 index is available to those who send in a stamped, legal-size, self-addressed envelope to Index Editor, Modern Photography, 130 East 59th St., New York, N.Y. 10022.

**OOPS!!!** We inadvertently omitted the Ercona/Astro lenses from the "1975-76 Interchangeable Lens List" in our Sept. 1975 issue (pg. 97). These interchangeable mount preset and manual diaphragm lenses fit the following cameras and those with similar mounts: Bronica, Exakta, Hasselblad, Leica, Nikon, Pentax, Praktina, Topcon.

The list includes the following: 65mm f/6.8 (\$269.50); 100mm f/5.6 (\$316.80); 125mm f/2.3 (\$695); 150mm f/2.3 (\$925); 150mm f/2 (\$1,500); 150mm f/1.8 (\$1,150); 200mm f/3.5 (\$855); 250mm f/2 (\$5,225); 300mm f/5 (\$595); 300mm f/3.5 (\$1,250); 400mm f/5 (\$850); 500mm f/5 (\$1,325); 500mm f/4.5 (\$2,325); 640mm f/5 (\$2,225); 800mm f/5 (\$2,825); 1000mm f/6.3 (\$3,325); 1000mm f/5.6 mirror (\$3,500); 2000mm f/11 (\$1,200); and 2000mm f/10 (\$8,800).



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# Seeing Pictures



**JULIA  
SCULLY**

**Some views on why the U.S. leads in creative photography and on the meaning of avant-garde imagery.**

One of the most interesting conversations I had in Europe last year was with M. Jean-Claude Lemagny. As curator of the photographic division of the Bibliothèque Nationale in Paris (the French equivalent of our Library of Congress), M. Lemagny is concerned with collecting photographs for their archives. In addition, he prepares exhibitions for the Bibliothèque's gallery.

But a description of M. Lemagny's position doesn't describe the role he plays in contemporary photography in Europe. With his understanding of the medium and his openness to new directions, he is an oasis of support and encouragement for many of Europe's young photographers. Furthermore, his acuteness and perception make him an unusually apt commentator on the complex and rapidly changing state of photography today. During an interview one quiet Saturday afternoon in his office at the Bibliothèque, I queried him about the differences between European and American photography. However, his views often went beyond that subject, and I'd like to pass his comments along.

Without hesitation M. Lemagny acknowledged that America is the leader of today's creative photography and has been for the past 50 years. However, his evaluation of the reasons why the new explosion of photographic expression took hold in the U.S. rather than Europe provides a perspective which perhaps can come only from the critical distance of another continent.

M. Lemagny sees Europe's long artistic tradition as a hindrance to its ready acceptance of photography. "Europeans think that only painting and sculpture is art," he said. "America is more open, Europe more closed because of its long history and tradition. Europeans make systems. By systems I mean something organized and closed. It is a tradition which comes from the schools of painting. I remember a friend of mine asked Ralph Gibson, 'What movement are you from?' Because in Europe, we think an artist is part of a movement."

Not only are Americans not hindered in their exploration of photography's potential by an ancient and codified artistic tradition, but, Lemagny told me with a smile, "Americans have no idea of what is good taste and bad taste. And that is probably the reason why now the Americans are becoming such good artists. As Marcel Duchamp said, 'Good taste was always the worst enemy of art.' Because, in fact, good taste is the custom—the taste of everybody for a long time. The Americans dare to do because they don't have this tradition." He cited an example, the young American, Elizabeth Lenard, who hand-paints her photographic images. Lemagny remembers asking her if she was influenced by old postcards or lithographs and she replied, "No, I do it because it's fun." For a European, this is unheard of."

According to Lemagny, even more significant to the medium's artistic rise than its ready acceptance is the form that the expression is taking. "The Americans were in advance in photography," he told me, "because they were the first to recognize the beauty and value of the modern world as the reality of life. Para-

*Continued on page 42*



ALEX WEBB

**"The truth is made of banal things."**





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logically positioned and well organized, so your hands fall into place almost automatically. Harmonized components and functions let you work quickly, while a



**Minolta XE-7: Its remarkably quiet and velvety-smooth shutter is a whole new experience in fine photography.**

venience features, such as speeds to 1/2000th second, interchangeable finders and screens and multiple-exposure capability. All of the electronic Minoltas accept any lens in the superbly crafted Rokkor-X or the economical Celtic system. They range from 7.5mm fisheye to 1600mm super-telephoto, including a variety of zoom and macro lenses, and interchange in seconds without f/stop realignment or special indexing.

For literature on electronic Minolta SLR's, see your dealer or write Minolta Corporation, 101 Williams Drive, Ramsey, N. J. 07446. In Canada: Anglophoto Ltd., P.Q.

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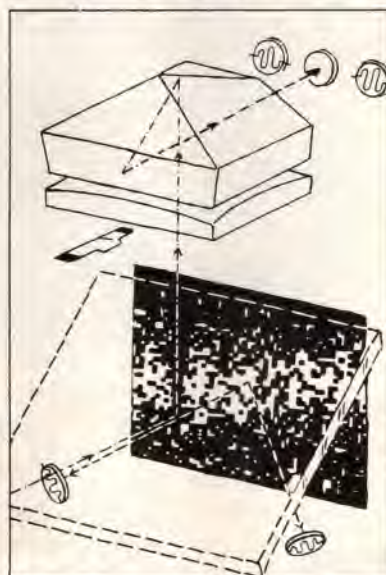
**Olympus OM-2: The cat's out of the bag, and the automatic version of the compact OM-1 is just as incredible.**

The fact that Olympus's famed camera engineer Y. Maitani has indeed built a fully automatic SLR into the same size body as the tiny Olympus OM-1 is one thing. The fact that this Olympus OM-2 is quite unique in all automatic SLR-dom is still another. But before we begin, let us state what for many of us will be prime considerations. The OM-2 camera will cost, at your dealer's, some \$150 more than the OM-1. It in no way replaces the OM-1, but is a distinct addition to it. Thirdly, the camera should become available early in the spring of 1976; and fourthly, it will be very scarce. Now to its operating features, and then to its uniqueness.

The OM-2 is exactly the same size as the OM-1. In fact, unless you look closely, you won't be able to tell one camera from the other outwardly. However, instead of an all-mechanical, cloth focal-plane shutter like the OM-1, the OM-2 has an electronically operating, cloth focal-plane shutter. When you set the aperture of the OM-2, using any of the standard Olympus Zuiko lenses (or others which fit the OM-1), the electronically controlled shutter of the OM-2 will automatically be set for the correct shutter speed by the metering system (meaning the camera is of the so-called aperture-preferred school).



**OM-2: Spitting image of OM-1—nearly!**



**Unique metering:** Top cells read finder for needle indicator, but bottom cells control exposure by measuring light from shutter curtain or film surface.

The regular meter on-off switch of the OM-1 has additional settings added to it on the OM-2. Besides "off," the meter switch plate indicates "auto," "manual" and "battery check."

On "off," there is no meter operating and nothing but the focusing screen visible in the finder. When you twist the switch to "auto," a transparent shutter-speed screen from 1 to 1/1000 sec. and a needle pointer move inwards into the picture area from the left-hand side. For any aperture you select, the needle will indicate the shutter speed to be set. Although 1 sec. is shown as the lowest number on the scale, the metering system will actually set shutter speeds automatically down to about 60 sec.

When the switch is turned to "manual," the shutter-speed scale disappears and only the meter needle and plus and minus indicators are left. Now you can adjust shutter speeds and apertures manually to center the needle, as you would in any non-automatic match-needle camera. The shutter still remains electronically timed, but the lowest manual speed available is 1 sec.

On "battery check," a red signal at the back of the camera lights up when the two MS76 cells in the camera bottom are O.K. If they aren't, the light doesn't light. But . . . if there is only enough juice for ten more rolls of 36 exposures, the light blinks!!! This is a big improvement in battery-check lights.

*Continued on page 34*



# Vivitar Series 1<sup>™</sup> 70-210mm f3.5 automatic zoom lens with macro focusing.



This is the original automatic zoom lens for 35mm SLR cameras that also provides macro focusing capability. A unique mechanical design permits both zooming and focusing with the same control. Although this lens has a large maximum aperture, it is surprisingly short and light. These seemingly contradictory features were reconciled by the extremely sophisticated computer programs with which the designers worked. Most significant of all in practical picture taking situations is the high performance, accomplished by a novel approach to zoom optical design. This was another computer suggested departure from conventional zoom lens configuration. The quality of performance thus produced was previously unavailable in zoom lenses and compares favorably to the finest original equipment telephoto lenses.

The versatility of macro focusing combined with a three-to-one telephoto zoom make this a remarkable all-purpose lens; particularly for the photographer who does not care to compromise on performance. A specially anodized finish on the lens mount and deeply checkered vinyl non-slip grips provide for absolutely positive focusing. The Series 1 70-210mm zoom, like the other Series 1 lenses, cannot be manufactured quickly in large numbers. For this reason, current demand for this lens somewhat exceeds supply. Put in your order, be patient, and your Vivitar dealer will get you one as quickly as possible.

## Optical Specifications

Construction: 15 elements  
10 groups  
Angle of view: 11-32 degrees  
Minimum focus distance: Normal:  
From focal plane—6'6 1/2"  
Macro:  
From front of lens—3"

Maximum magnification in Macro: 1:2.2

## Mechanical Specifications

Filter size: 67 millimeters  
Weight: 31 ounces  
Length: 6 1/4 inches  
Max. diameter: 3 1/4 inches  
F/number range: f3.5-22  
(EE coupled lenses to f16 only)

## Vivitar Series 1 Program

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The 35-85mm f2.8 auto variable focusing lens is likewise a definite advance in lens design.



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# Movie Making

by Tony Galluzzo

Oscar-winning cinematographer Conrad Hall speaks out—on technique, "old vs. new" photography, and why Gordon Willis did not get an award for *Godfather*.



Sometime during the past summer, I had the opportunity to visit the Maine Photographic Workshops where Conrad Hall (best known for photographing *Butch Cassidy and the Sundance Kid*) was holding forth, conducting a unique seminar for the benefit of about 20 students. Many of them, already "in the business," came to show their films, look at Conrad's prodigious output of features and talk filmmaking.

## The man behind the image

Viewing the main body of Hall's work is enough of a study course in lighting and camera work, even without Hall's presence. With that presence you begin to understand much more: the thinking, dedication to craft and life philosophy behind those images on screen. Besides *Butch Cassidy*, films shown during the week included: *The Professionals*, *In Cold Blood*, *Fat City*, *Cool Hand Luke*, *The Saboteur of Morituri* and *Electra Glide in Blue*. (Those of you interested in next year's seminar should write to: David Lyman, Director, Maine Photographic Workshops, Rockport, Me. 04856.)

While I cannot infuse this magazine paper with the enthusiasm of Conrad Hall's voice, you will simply have to imagine it, along with his candid attitude and unbounded energy in staying up to the wee small hours answering the endless stream of questions from this often incisive and demanding group of students. What follows is only part of an extended interview I conducted with him.

TG: What made you decide to teach this course? You don't seem to be into teaching.

CH: I'm certainly not into teaching. I think the real reason is that the whole idea frightens the hell out of me. To teach and get in front of people and try to articulate things that I normally do instinctively.

TG: What amazes me is how you can sit back there while a student's film is going on and comment continuously on the film, on what's happening, and try to advise on what's wrong or what's right with the film.

CH: Well, I think I chose to do it because of the challenge. And it's just a way to stretch myself some more and see whether I'm any good at it. I'm not really trying to teach

anything. I'm trying to get people involved, together with me, in a way that turns them on and makes them want to go out and teach themselves. I don't feel what they learn from me, specifically, is all that important, but only insofar as I can get them steamed up.

TG: I think a lot of things that you talk about are very helpful, judging from comments I've heard here. They have an idea in mind, they wonder if it will work, they want to be sure it will work, and you've done practically all of it.

CH: Well, I've been working as a cameraman ever since I got out of U.S.C. in 1949, so I do have a lot of experience.

TG: People are always curious about the relationship between the cameraman and director. To single out one of your more demanding projects, how was it to work with John Schlesinger on *Day of the Locust*? For instance, where did his vision leave off and yours take over?

CH: It's very much John's film. He's a man who's in control of every aspect of the film. Every aspect. Conceptually, it is all him, as far as I'm concerned. But I did the cinematography. I mean, I contributed tons of visual things. But it's so hard to think of details in 112 days of working together. It's like: he's got a finder and I've got a finder. And he lays out a shot while the people are rehearsing, and I lay out a shot. And he looks at me while he's laying out a shot and I look at him. And every now and then, we'll look down at our finders and he'll say: "What have you got on?" And I'll say: "I've got a 40 on." And he'll say: "Well, I've got a 50." But at least we're in the ball park together and we're thinking alike.



**Many-faceted:** Hall tore himself and films apart for students' benefit.

TG: One scene that I especially like is when Donald Sutherland and Karen Black are starting to dance. It's a kind of abortive sexual thing. And then they wind up crying. Now that's not in the novel, but he put it in and it doesn't really detract from it. How did he compose that scene? It's one long shot, if I'm not mistaken.

CH: Oh, I know. That's my favorite shot of the whole picture.

TG: How long did that take to get?

CH: A long time. I mean, we came in in the morning and ... John rehearsed with the actors and they played the scene. And they played it almost "best" during the rehearsal, if you know what I mean. Donald Sutherland was marvelous in the role of Homer. He was fantastic in the rehearsal and so was Karen, by the way. And the way it happened was that while they were doing it ... John was kind of walking beside them

*Continued on page 134*



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## the camera collector by Jason Schneider

**You may never have heard of Dr. August Nagel, but you've undoubtedly seen cameras made in his American-owned factory.**



Few American photographers would be conversant with the products of the erstwhile Dr. August Nagel factory in Stuttgart (despite its enviable reputation for sound, beautifully designed, nicely finished cameras) were

it not for a singular event that took place sometime in 1932—namely, the factory's acquisition by the Eastman Kodak Co. who changed its title to Kodak AG. From that time forward, Retinas, Recomas and, to a lesser extent, Pupilles and Vollendas became familiar names on the American photographic scene, though understandably most of our countrymen thought of them as "German Kodaks" rather than "Nagels." In any case, their importation came to an



**Plain but portentous**, Nagel No. 10 subtly hinted at firm's future grandeur.

abrupt end in 1939, and while Kodak AG was reconstituted in the same virtually intact factory after the war (to produce a seemingly endless succession of postwar 35's—Retinas, Retina Reflexes and Retinettes), things weren't quite the same.

If there is anything that bespeaks the Nagel-Kodak era of the 30's, it's their elegantly designed roll-film and sheet-film

cameras. The Nagel factory was justly famous for its nickel and nickel-chrome finishes and exceptionally fine black lacquer which adorned many of their "styled" creations. While the following quartet of Nagel-Kodak cameras (culled from the extensive collection of John Kowalak of River Edge, N.J.) isn't truly representative of their "restrained art deco-ish" appearance, all have one thing in common—they're rare. And, as you'll see from their estimated values, all but the first are quite valuable.

When Dr. Nagel, the former head of Contessa-Nettel, resigned as director of production of the newly-formed (1926) Zeiss-Ikon company in 1928, one of the first products of his own fledgling firm was the Nagel #10, one of the few pedestrian cameras Nagel ever made. It was basically a stripped-down 6.5 x 9cm pack camera



**Anything but rank**, the Ranca was one of the rarest early roll-film Nagels.

quite typical of its day, and notable chiefly as being the precursor of the spiffy Kodak Recomar 18 of the late 30's.

Unlike the Recomar, the #10 (and its larger 9 x 12cm cousin, the #14) lacked any lateral or vertical movement of the front standard. To focus the 10.5cm f/6.8 Nagel Anastigmat lens (which stopped down to f/36), you grabbed onto two knurled lugs on the underside of the lens board and pulled the whole business outwards until a metal pointer coincided with the proper distance (1.5m to "Ferme;" i.e. distant, or infinity). You could then lock the distance setting by pushing in a tab emerging from the front standard's bottom right side. The shutter, an everset Pronto (with speeds of 1/25-1/100 sec. plus B and T) was equally primitive.

Now you notice that I said "primitive," not chintzy or ill-conceived. Inexpensive and derivative the Nagel #10 certainly was; poorly constructed or finished it emphatically was not. The nickel-chrome focusing rails and side struts were gorgeous. Ditto for the slide-out ground-glass focusing unit, its spring-loaded metal catch, and the black enameling adorning the rest of the camera. The hexagonal cutout in the middle of the front section between the focusing rails and elongated hexagonal chrome bezel around the focusing scale pointed toward future Nagel elegance. Incidentally, the total production run of #10

*Continued on page 144*



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# photo- tronics

by Ed Farber

The complex world of automatic multi-flash: Here's how to set up for proper balance, plus cautionary words on the pitfalls of combining different flash units.



As automatic flash units proliferate, more and more photographers find it convenient to use multiple-flash techniques wherein two or more packs are employed to illuminate a subject. Confusion and misunder-

standing seem to cloud the basically simple reasoning required to make successful multiple-flash shots automatically. And then, as always, there are exceptions that disprove the rule, particularly if slave systems are involved.

Let us first restate that any automatic flash can behave only as instructed by the sensor. What the sensor "sees" is what you get, provided you have entered the proper adjustments to camera and flash, and provided the camera sees what the sensors "see." Therein lies the automatic multi-flash dilemma. The sensors neither see alike, nor do they see the same view as the camera lens.

### Two lights: the basics

If we were to make a two-light portrait with incandescent lights, we might very well position one at the camera as a fill light and one at a 45° angle to one side and above the subject as a keylight or main light. If the lamps and reflectors were identical, the lighting would be agreeably soft with some modeling due to the keylight being closer to the subject. We could take our light meter and adjust the lamp size or the distance of the keylight from the subject till the key provided about three stops more intensity on the subject, and thus get fairly strong modeling.

If we replaced these incandescent lamps with two identical automatic flash units properly programmed for the film, f/stop and distance range, and tied them together with trip cords to fire them simultaneously, the lighting would be quite flat. The built-in sensors would see the light from both units, and both would turn off when they had seen identical amounts of light falling on the subject area viewed by the sensor. Bear in mind that the main (or key) light would look at the subject from a different

*Continued on page 24*

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### PHOTOTRONICS

Continued from page 18

angle than the camera, and thus might burn somewhat longer or shorter than the fill light at the camera. But generally, the differences would be small. If you prefer somewhat more dramatic lighting, you could increase the exposure of the main light by two or three stops. How do you do that? If your automatic permits the use of several f/stops, you can make the setting on one several stops *smaller*. Smaller, because you are then telling the flash unit to produce that much more light. If the camera was set for f/5.6 and the fill likewise, you would set the main light for f/11.

Continued on page 26



**What you see is what you get?** Not always. Two identical automatic strobes are linked to fire simultaneously, one for fill light (near camera) and one for key (main) light at an angle and twice as close to the subject. Result should be a much stronger key light.



**Ordinary results:** Because of the nature of automatics, above setup produced flat, even lighting.



**Dramatic results:** Same setup, but modeling was introduced by programming key flash to pour out more light. (See story to learn how it's done.)



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## PHOTOTRONICS

Continued from page 24

In practice, better lighting would result from a one-stop underexposure for the fill light as related to the camera setting. Thus, if the camera were at f/8, we might make the fill-flash setting as if the camera were set to f/5.6. The fill light would then turn off as soon as its sensor had seen that much light—one stop less than required! The main light, being set for a presumed camera setting of f/16, would continue to burn longer until its sensor has seen that much more light—one stop more than required.

### Film speed trick

If our automatic electronic flash does not provide for more than one f/stop in its program, it's necessary to alter the exposure by changing the ASA settings. In essence, you are fooling the flash into thinking it is exposing a faster or slower film than you're actually using. Film-speed ratings are direct ratios, so a film with a 100 rating needs only half the light of a 50-rated film. To vary your lighting ratio by two stops, you would change the film-speed setting on the flash unit from 400 to 100, for example. This way, you would get two stops more light since the light exposing your film will vary as to the square of the f/stop: two stops more, requiring four times the light.

If your flash tells you to use f/8, and you are using 100 ASA film, set the fill flash for 100, the key flash for 25 (four times more light), and the camera for f/11. If the automatic employed as a sidelight has a confirmation light, you can use that to be certain you are getting the light you need. Some experimentation is required, as with any multiple lighting setup, to find out just what you like, but there are other problems.

### Slave hang-up

Some automatics do not work properly when tied together with trip cords. The trip circuits are involved in the sensing systems and the two units will interact. Certain brands do not work well with certain slave devices, because the slave circuits upset the sensing systems. Some have identical models that can be hooked up together successfully on automatic, but other models of the same brand will not be compatible when connected with trip leads. It's best to consult your dealer, or write the manufacturer, when you want to tie units together with trip leads or use slaves. Your dealer, however, cannot be expected to know how well his brand will work on automatic with every slave device around.

What is more, though identical models will work in pairs as slaves, different brands or models may not do so because of different delay times at the start of the flash and the rate of change in light output at the start of the flash. Therefore, do not be surprised if strange exposure problems arise using automatic multi-flash with mixed models or slaves. It would seem best not to tie mixed units together with trip cords unless the manufacturer says so.—THE END





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Before you could say "What will they think of next?" they thought up a new exposure system for the flash mode, promising new techniques for the knowledgeable photographer and paving the way for new possible camera designs and flash systems. I had been getting more confident with my late-model SX-70 when I wrote in December about using the camera's flash to trigger an off-camera electronic flash unit, producing a better modeling of light and taking advantage of the small aperture and depth of field at 10 1/2 in. I have never cared for the straight-on flat lighting of flash, and when I positioned the electronic unit perfectly for the lighting I wanted and found that I had also estimated the unit's distance perfectly, my confidence grew. It never occurred to me that I might have a guardian angel inside the camera watching over the scene to trim up my exposures for me. Little did I know about the new improvement.

In a follow-focus flash system, the exposure depends upon where you focus. In the SX-70, as I had known it, you automatically set the aperture for the flash-to-subject distance as you turned the focusing wheel, while the shutter speed remained fixed at 1/40 sec. Looking over the final draft of my Dec. column, I noticed that the flash settings in the chart, at each specific distance, related to the daylight settings in a series of reciprocal exposures, and I decided to experiment with the flash as a sort of fill light for outdoor pictures. The flash setting at 5 ft. would be 1/40 sec. at f/24, which was approximately equal to the daylight setting of 1/120 sec. at f/14 when my meter read 200

Continued on page 41

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Vivitar 55mm  
F2.8 automatic  
macro lens





# Ed Scully on color

**How's your heart? Can it stand a really bloodcurdling discussion of color-image stability? If the answer's "yes" to both, read on.**



In recent columns, I've been very enthusiastic about the image stability of Cibachrome and the new Polacolor 2. On the other hand, I have emphasized that color-image longevity is relative. The hard facts seem to be

that no matter how carefully you store and otherwise treat your color image, it will fade in time. At the first invitational Colloquium on the Collection and Preservation of Color Photographs, held at the International Museum of Photography at Eastman House, Rochester, N.Y., the points of view were different but the main opinions supported that position. And a lot more points were made that were well worth the time spent talking about them in George Eastman's sitting room. There, with the seemingly eternal colors of the classical portrait paintings gracing the walls to remind us of the difference between pigment and dye, we compared notes from many different disciplines.

## **The question: Why is color not collected?**

Although it may not be evident to casual hobbyists, it is obvious to professionals that color photography is under-represented in museums and galleries worldwide. Less well-known, except by those photographers who find it almost impossible to sell pictures for museum collections (as opposed to showings of photographs not owned by the museum) are the reasons that curators are reluctant to buy color photography. This was the question the colloquium tried to answer. The old excuse that the images are too fugitive is not good enough, because other media used in the visual arts are as temporary.

The highly technical character of the discussion, as well as the divergent backgrounds of the participants, gave the meeting an unusually open character. From the laboratory side came the relatively unknown facts that color images fade whether stored in the dark or shown regularly. The rate of fading is slower, but the inexorable process goes on to its appointed chemical end and the image disappears. Equally surprising is the fact that some color materials—the discussion covered both film and prints—have better "dark" stability while others have better "light" stability. This led to a discussion of image fading under dif-

fering light sources in which some of the commercially oriented participants stated that they felt the whole question of color-image fading was being overemphasized. According to them, the time needed for fading of a properly made print, even with the more fading-prone chromogenic materials used for what are sometimes called "conventional commercial color prints," is long enough not to be a practical problem. And, as a corollary to this thesis, they added that, in any case, the per-year cost of pleasure derived from a color picture during its image life is quite low.

One of the curators looked a bit ill at the concept of a per-year cost of pleasure from a fading work of art, but the others took this unusual view in stride. Having taken a hard look at the real problems and the limitations of the solutions available today, their position at the close of the colloquium was one of compromise; maybe we have to collect color even though it's going to fade. To this somewhat sad, though realistic, position they added their need to do their best to slow the fading process.

## **A frost-free refrigerator-freezer?**

The most unusual recommendation for practical storage of color images came from Henry Wilhelm of the East Street Gallery, Grinnell, Iowa. (The ground rules of the colloquium indicated there are to be no quotes without approval until the proceedings are published, thus the anonymous character of most of the participants.) The material was an abbreviated version of a chapter in his soon-to-be-published book, *Preservation of Contemporary Photographic Materials*. The suggestion, quite simply, was to use a frost-free refrigerator with a separate freezer compartment. Not any frost-free refrigerator-freezer, but one with a separate cooling function so the refrigerator portion used for color-material storage is dry. Other refrigerator-freezers produce dangerously high humidity levels.

The recommended method starts with the purchase of a high-quality humidity meter; Wilhelm showed an excellent hygrometer sold in the U.S.A. The Abbeon Certified Hygrometer, Model AB167, is available from Abbeon Cal Inc., 123 Gray Ave., Santa Barbara, Calif. 93101. He had forgotten how much it cost, but knowing Henry, I'm sure that it is the cheapest hygrometer available having good enough quality to trust with color materials. The principle of cold dry storage has been known for a long time, but Henry, with his Sears frost-free, made it a real possibility for most of us. I know that means three refrigerators, one for slides and prints, one for unexposed film and unopened boxes of paper, and a third for the family groceries. The way to economize is to have a small one for the groceries. It's better for your figure anyway. I'll review Wilhelm's book when we receive it.

Another practical approach came from Ken Lieberman of New York's K&L Color Labs. He strongly recommends making b&w separation negatives from your very important slides. The price for three color separations, \$40 per original transparency, will be deducted from the price of the Dye Transfer print when it's made. Taking the negatives out of K&L's files will cost you an extra \$10. Ask him for a copy of his price

*Continued on next page*

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## ED SCULLY ON COLOR

*Continued from previous page*

list and the intriguing advertisement "What is to become of your color transparencies 100 years from today?" Ken Lieberman is at Berkey K&L, 222 East 44th St., New York, N.Y. 10017.

Rather than belabor the point further, I'll report some of the interesting statistics, rumors and opinions that were passed around. As an opener, 85 percent of photographic materials sold have to do with color materials. The motion-picture film preservation problem is worse than ours; it costs \$25,000 to make a release print from b&w separations. Color separations may be made on a single width of film in order to avoid the problem of differential shrinkage and subsequent difficulty in registration; the Kodak representatives reported that this is not a serious problem with today's base materials.

Color is not the only problem. B&w materials are attacked by urban pollution and, according to one participant at the colloquium, may not last as long as well-stored color. Another opinion from someone who might have better-than-average sources was that Kodak would discontinue making b&w film during our lifetimes. The very important point was made that we must differentiate between preserving information and images, the latter being the museum curator's concern. Another discussion covered the possibilities for regenerating color information from faded films or prints. And still another approach was shown in the computer-based color printing done by Case Hoyt. Look at *Gourmet Magazine* or the Eastman Kodak Annual Report's color illustrations, and you will see a new image structure that is free from the expected halftone dot pattern.

## Print faster; project dupes

The practical solutions discussed were not limited to storage, but included a proposal that slides and color negatives be printed by processes which are faster in order to minimize the exposure to color-destroying radiant energy. It might even be a good idea to dust off the technique of printing with electronic flash. And, of course, the fewer times you project a slide, the longer its color will last. This suggests a serious interest in making good duplicate slides—and maybe never projecting originals except for the brief flash exposure needed to make a duplicate.

The colloquium was one of the best of its kind. Although the participants were worlds apart in backgrounds and fields of interest, they all contributed to a good understanding of the several facets of this complex chemical-physical-esthetic problem. Bob Doherty, the Director of the International Museum of Photography at Eastman House, and Bill Jenkins, Assistant Curator of 20th-Century Photography at IMP, are to be congratulated for their efforts in both assembling and steering this very productive effort. And a tip of my hat goes to the young interns and staff who sat patiently and quietly on the couches behind the armchairs filled with participants. They will face this problem when they go out on future assignments; their interest during and questions after the sessions sug-

*Continued on page 151*





Death haunts Van Gogh's last self-portrait.

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Beside almost 1,700 works of art, Van Gogh also bequeathed to the world—in 661 letters to his brother—one of the most moving autobiographies ever written. It shows this dauntless man trying to learn Greek in order to be allowed to preach to Dutch coal miners. You find him, his hatband stuck full of candles, painting the stars at midnight. You trace letter by letter, canvas by canvas,

the collapse of his sanity and his subsequent suicide.

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## KEPPLER ON THE SLR

Continued from page 10

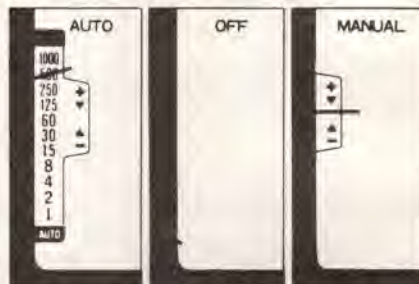
The ASA-index setting dial on the OM-2 offers automatic shutter-speed compensation of  $\pm 2$  f/stops above and below the correct setting. The exposure compensation and aperture you set do not appear in the viewfinder (well, you can't have everything).

Another missing feature: no mirror-lockup control . . . BUT . . .

So far, what we have described is admittedly what one might have expected from all the forecasts — a fully automatic SLR somehow jammed into the tiny space of an Olympus OM-1. But Maitani, as we might have guessed, didn't leave well enough alone. And where he has gone in SLR metering no one else has approached.



Looks like an OM-1, but . . . Left control switch has "manual," "auto" and "check" for battery. Knob on right has ASA index plus exposure compensation for auto control.



Three focusing views: "Auto" shows shutter speeds set, "off" shows nothing, "manual" shows centering needle.

The Olympus OM-2 does not have two CdS cells metering the light from the focusing screen, as does the OM-1 and most other SLR's. The OM-2 uses four cells! Two silicon blue cells are located within the mirror chamber towards the front and point backwards at the shutter. What the devil are the cells doing pointing backwards? Why, they are measuring a center-weighted, white, reflecting spattered area on the front of the first shutter curtain. During focusing and viewing, the two top CdS cells on either side of the eyepiece measure the light from the focusing screen. They indicate in the finder what the required shutter speed will be in the automatic-exposure mode, and serve as the centering needle for manual operation. The actual auto exposure isn't measured until you press the shutter release and the mirror flies upwards. Then, the incredibly fast-operating silicon blue cells within the mirror chamber actually measure

Continued on page 36



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# SMP News Notes

By **ED HANNIGAN**

Dean, School of Modern Photography



**I**N RECENT MONTHS and years a couple of home study courses in photography—closed down. Because there probably are a number of students who may not have been able to complete their courses due to the closings, the **School of Modern Photography** has initiated a special program to aid these individuals.

This new **SMP project offers both academic and financial credits** for those lessons which these former students had completed—and, a transfer of their studies into the **SMP Course in Modern Professional Photography**. We are hopeful that this new program will aid many of the “stranded” students to complete their photographic studies so as to earn their diploma.

Students of the discontinued home study courses in photography who would like to complete their lessons should write to James Dunn, School of Modern Photography, 1500 Cardinal Drive, Little Falls, NJ 07424 to arrange for an **SMP Staff evaluation** of the course work that was completed and to obtain details on how they can transfer over to the **School of Modern Photography**. Please give complete information as to the course you were taking, how many lessons you completed, grades you scored and any other information which would be helpful in setting up the program for you.

There is no obligation on your part, naturally. But, we thought you would like to know that we here at **SMP** are trying to do something to ease your plight and, thereby, make things a bit better for you and photography, in general.

Those of you who do transfer to **SMP** will be travelling in fast company for **SMP'ers** have a way of scoring successes with their photography as we record here each month—and, this month is no exception . . . **Ronald S. Gach** of Detroit, MI is working full time as a photographer with **Photo Corporation of America**. A 1975 graduate of **SMP**, he wrote that he has done more than 12,000 portrait sittings in the past year . . . **Bill Ryan** of Trenton, NJ has been doing very well as a freelancer for newsphotos in the Garden State capital—so well, in fact, he has just gone on as staff photographer for **The Trentonian** . . . **SMP'er John L. Barus** is a fulltime police sergeant in Scott Township, PA and doubles up as police photographer. Recently he did picture coverage of the disarming of a pipe bomb found in a gasoline station—and, one of his photos was used in the **Pittsburgh Post-Gazette** with a nice credit line.

When he noted a temperature sign on a bank in Damariscotta, ME reading 105°, **SMP'er Gardner Sherman** of Lakeville, MA made a shot of it and sold it to the **Damariscotta News** . . . **Edgar L. Freeman, Jr.** of Pendleton, OR was johnny-on-the-spot to picture two young boys who had been lost in the woods and were brought out on horseback by their rescuers. His photo made page 1 of the **East Oregonian** . . . **Richard A. Berry** of Wilmington, NC scored with a two page spread of pictures in the **Library-College Omnibus** magazine.

**Rockie L. Gaddie** of Plano, TX had two of his pictures published in newspaper ads and flyers for “The Fireplace Doctor,” a local business concern . . . **Jeffrey B. Metros** has had five of his pix run in the St. Augustine (Florida) **Record** . . . **Charles B. Williford** of Camden, AR has broken the ice with two shots in the Camden News and one in the **Republican Eagle**, published in Red Wing, MN . . . **Max G. Bunyan** of Miami, FL had four of his pictures illustrating an article he had in **The Retired Officer** magazine . . . **SMP'er N. Gopinath** of Bangalore, India scored with two photos illustrating an ad for a local heavy industrial crane installer firm.

On the prizes and awards fronts, **Patricia Renck** of Pueblo, CO captured a fourth place in the **1975 Colorado State Fair** contest and topped that with a second place winner in the **Eastman Kodak Community Service Photography Awards** contest . . . **Russell A. Dodd** of Middletown, NY won Best in Show and a 1st and 2nd place award in the Professional Class at the Orange County Fair and will soon have a one man show in the **Hanover Trust Bank** in New York City . . . **Thomas F. Wilson** of Pensacola, FL entered twelve prints in the Pensacola Interstate Fair competition and gleaned three first places, one second, an honorable mention and a special award!

**George Kaneshige**, an **SMP'er** in Honolulu, HI took individual honors in the **Hawaii Nikkor Club** with a gold medal in the B/W division . . . **Donald K. Colson** hails from Sierra Vista, AZ and he wrote that he had captured two first place awards and one Best of Show in the Cochise County Fair . . . In the Kalamazoo, MI fair event **Raymond Liles** won three first places, two seconds and one third for quite a sweep of the honors . . . **Rolf Moller** of Fredericton, British Columbia, Canada produced an exhibition of photos titled “Safety in the Forest” that has been travelling through out the country and has been seen by more than 50,000 people to date . . . **Rich Kirkham** is an **SMP graduate** hailing from Yardville, NJ and he walked off with Best of Show at the Lawrence Arts Council, two first place and one 2nd in several competitions!

## KEPPLER ON THE SLR

Continued from page 34

the center-weighted light falling on the first shutter curtain itself just before the second shutter curtain begins to travel, and these cells actually determine the measured exposure timing.

The shutter-curtain slit width is fixed, of course, during the exposure, but for long exposures of over 1/15 sec., when the shutter is open fully, the metering system actually continues to measure and adjust exposure, reading the total integrated light falling on the film emulsion itself! Between 1/60 and 1/15 sec., the cells measure a combination of the first shutter curtain and film. (If you're wondering what the reflecting shutter material looks like, see the drawing on page 10.) This means that if you are making a long exposure at night and the light in the picture changes during the exposure, the Olympus OM-2 will compensate and either prolong or shorten the exposure—it's the only 35mm SLR to have such a feature. *Even more sensational: the cells can measure the light from automatic electronic flash units right from the film surface through any lens attached to the camera and adjust the electronic flash brightness accordingly!*

Aside from the automation and the new shutter mechanism and metering system, the Olympus OM-2 is almost a duplicate of the OM-1, taking the same lenses, finders, screens, accessories and motor drives. Only a sharp-eyed Olympus OM-1 expert would notice the additional plug near the screw-in hot-shoe sync adapter, which is part of the new autoflash hot-shoe connection. There's also a new red reset lever and marking on the front of the camera. This is the override



**New features on OM-2:** Reset control on lens mount (left) resets camera after battery change. Battery-check light (right) blinks when there's juice for ten film rolls or less.

which allows exposures at the B setting and resets the camera to automatic once the batteries have been changed. OM-1 owners who have been bothered by the rear eyepiece getting smudged with eyelash grease might notice the improved recessed OM-2 eyepiece, which prevents this. However, the recessing was actually adopted, some months ago, in late-model OM-1's.

And there you have it, dear friends—a complete camera system of two models, one offering automatic and manual operation, the other manual match-needle only but both accepting every single accessory in the catalogue—the only system that can make such a claim.

Continued on page 130



# Compare the advantages. FTb is the obvious choice.

We think that the FTb is the best camera in its class in the world. It earned this distinction. It has solid value. Meticulous construction and quality. It has the kind of refined performance features, versatility and human engineering you'd expect from Canon. But don't take our word for it. Decide for yourself.



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● **Versatility** The unique FTb Booster lets the FTb read down to an exposure level of  $1/1,200$  at 15 seconds with ASA 100 film (EV-3.5). This coupled with the host of Canon accessories for every job from photomicrography to astrophotography makes the FTb a camera a novice can grow with—or a professional can't live without.



● **The Viewfinder** The FTb's viewfinder has everything you need to stay in complete control. It shows shutter speeds, over- and under-exposure warning marks, a stopped-down metering index and meter needle and aperture indicator ring. The bright focusing screen has a microprism focusing aid, and the metering area is shaded, so you never have to guess what you're measuring.



## ● Control Flexibility

The FTb's Stopped-Down/Self-Timer lever activates the self-timer and stops the lens down for checking depth-of-field. Adjacent controls can lock the aperture and lock up the mirror.



● **Film Loading** The FTb incorporates Canon's exclusive QL quick film loading system. All you do is position the film leader, close the back and start winding. It saves time and prevents film waste.



## ● Exposure Metering

Any photographer serious about precision in exposure knows that it's vital to understand the exact area of the subject that the camera's metering. The spot metering system of the FTb measures only the central 12% of the viewfinder area. In difficult exposure situations, you never have to doubt that your exposures will be perfect.



## ● Breech Lock Mount

The lens mount of the FTb and all Canon SLR's is the exclusive Breech Lock system. When you push on a lens, the breech lock ring automatically turns slightly. All you have to do for a secure fit is turn the ring a little more. And because there's no turning between lens mount and body, there's no wear to affect sharpness.



● **Lenses** The FTb accepts all of the nearly forty superb Canon lenses, from 7.5mm Fish Eye to 1,200mm Super-Telephoto. These lenses are tops in sharpness, contrast and mechanical quality. They incorporate all of the latest optical refinements, including Spectra and Super Spectra Coating, the Canon Floating System and the most modern optical glasses.

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# Turning the Camera Inwards

Some photographic images are drawn directly from nature. Others are conceived first in the mind—and where they do not already exist in nature, are created for the camera.

This is Meryl Joseph's photographic genius. She "turns the camera inwards," and from an inward vision creates a visual statement of an emotion, myth or fantasy.

The series shown here is entitled "Bicentennial: The American Dream in Transition." It represents "...a union of technology with a dream of beauty at a time when America is undergoing a period of re-evaluation, in which myths are being exploded and given new definitions. A wrenching period of transition." She feels that the change will be "positive, with an ultimate harmony."

Meryl creates sculptures for photography with transparent materials selected for their radiance. These pieces, when explored and re-discovered through the camera, "assume their own reality."

She likes the F-1 system for this work because of its ease of handling, bright viewfinder, precision exposure metering and optical quality. "I need a camera with which I can have an intimate relationship. I'm very close to the camera. If I see something that is new, through the camera, I can re-structure the image; it helps to be able to forget that the camera is there."

"The half-stop increments on the FD lenses are very important to me—the lighting is complex and specific. I need to have very exact readings to capture the



vibrancy of the sculptures. Once I'm certain about what I want to capture, I must work quickly, and with precision. Since most of my work is done close to the subject, it's important for the camera to be well

balanced, responsive and dependable."

For most of her work, Meryl uses the F-1 with the FD 50mm f/3.5 S.S.C. Macro lens. This lens has been designed especially to give outstanding sharpness, contrast and flatness-of-field at close up distances. It focuses from infinity to 1:2 without accessories, and to 1:1 with the supplied Life Size Adapter. Since it has such a great focusing range, it is as suitable for general use as for close-up photography, and makes an outstandingly versatile "normal" lens. With the selective metering system of the F-1, the macro system equipment available (including two macro lenses, two bellows units, close-up lenses, extension tubes and eyepiece accessories) makes the camera ideal for critical close-up and macro work. Since there are subtle exposure differences in the work Meryl is photographing, the ability of the F-1's semi-spot metering system to isolate areas of different brightness is extremely important. And to her, "The brilliance of the viewfinder is vital in accurately visualizing the brightness relationships in the sculpture."

Her photographic involvements have included shooting stills for filmmakers, theatrical photography, several New York City shows, a job as photography director on an archeological expedition and seven photographic books, the most recent of which is Random House's *Who Won Second Place at Omaha?*

Meryl Joseph is an artist who looks within herself for an image, and then makes it a reality with a camera.

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|                                                                                         | 40 exposure         | 2.90       | 2.80      |
|                                                                                         | 72 exposure         | 4.80       | 4.70      |
| 126    | 20 exposure         | 1.30       | 1.20      |
| 110    | 20 exposure         | 1.30       | 1.20      |
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|                                                                                         | 20                 | 3 1/2 x 3 1/2 | 3.25                  | 5.00                        |
| 110    | 12                 | 3 1/2 x 4 1/2 | 2.15                  | 3.40                        |
|                                                                                         | 20                 | 3 1/2 x 4 1/2 | 3.25                  | 5.00                        |
| 127, 120, 620                                                                           | 12                 | 3 1/2 x 3 1/2 | 2.55                  | 3.85                        |
| 135mm  | 20                 | 3 1/2 x 5     | 3.85                  | 5.55                        |
|                                                                                         | 36                 | 3 1/2 x 5     | 7.15                  | 9.35                        |
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| Hi-Speed Ektachrome                 | 5.25        | 5.15      |
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|---------------------------------------|-------------|-----------|
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| 126 — 20 exp. 3 1/2 x 3 1/2           | 5.00        | 4.90      |
| 110 — 12 exp. 3 1/2 x 4 1/2           | 3.40        | 3.30      |
| 110 — 20 exp. 3 1/2 x 4 1/2           | 5.00        | 4.90      |
| 135mm — 20 exp. 3 1/2 x 5             | 5.55        | 5.45      |
| 135mm — 36 exp. 3 1/2 x 5             | 9.35        | 9.25      |
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## INSTANT PICTURES

Continued from page 28

candles per square ft. of light reflected from my model's face.

I set the focus for 5 ft., put in a new FlashBar, and moved in until the model was in focus. When I pressed the red button, the camera ejected the picture but the flash did not go off. I tried a couple more, then put the experiment aside, figuring that I had fouled up the flash or that something was wrong with the FlashBar itself. (This was one of my earliest experiments after the SX-70 first appeared and, in a hit-or-miss fashion, had some promising results.)

I put the experiment out of my mind, but later in the studio I picked up the camera, with the same FlashBar, and made a perfectly exposed picture. Then I remembered the experiment and went back to the pictures to find three fully developed daylight prints made without flash.

Looking over some of my other SX-70 pictures, I found a print for which I had inadvertently used the flash straight on the model in front of a mirror. The reflected



**Without flash:** Camera was set for flash but didn't fire in strong outdoor light. Electric eye was able to match aperture which had been predetermined by focus.



**With flash:** You can still shoot flash outdoors, but you must cover electric eye to blind it from daylight. You'll have to adjust L/D control to avoid overexposure.

hot spot from the glass had made me reject the composition, but now I could see that the picture was also badly underexposed. I began to realize that I was not using just a follow-focus system, but that the electric

Continued on page 50



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## SEEING PICTURES

Continued from page 8

doxically, the first person to show this fact to Americans was a European—Robert Frank. After him there was a trend that included Friedlander, Winogrand, Uzzle and Harbutt."

Because this is "the first time in the history of humanity that artists became aware of and dealt with the artificiality of the environment and showed that there was a beauty in it," Lemagny said, "I think this is one of the most important things in American photography."

"Now there's a similar trend in Europe, like the Italian, Roberto Salbitani, who discovered that in a certain manner all things are artificial, and Bernard Plossu, a Frenchman, who in his series called 'Hyper Banality' showed that the truth is made of banal things."

In spite of America's initial lead in the development of a truly photographic expression, differences between American and European photography are secondary because "photography is a very international art by nature" due to its easy and widespread reproducibility.

In the attitudes of the young photographers today, Lemagny sees more similarities than disparities, regardless of geographic differences. He spoke of their search for "a new language." Looking back on the great period of reportage represented by Henri Cartier-Bresson

and Doisneau in France and W. Eugene Smith in the U.S., he said, young photographers admire the work of these great photographers but they do not agree with the "system of speaking" which they represent. For example, Lemagny explained, "When Doisneau shows you a *conciérge* or a *gendarme*, it is the perfect *conciérge* or *gendarme*. The photographer speaks exactly your language; he puts your feeling into perfect words. The young photographers are beginning to think that this sort of language is beautiful and effective, but . . . it becomes a danger. The idea of presenting a lasting and universal image of a *conciérge* or *gendarme* does not take into account more complex, mysterious and changing aspects of our environment, and supports the idea that society is still and unmovable."

### Looking in and out simultaneously

More and more photographers are concerned with attempting to deal with subjective reality. "The work of a photographer like Duane Michals, who is exploring the inner world, is a very important influence on the new human photography," Lemagny observed. "I think that young photographers are now very aware that an image can be a straight image and, at the same time, an image of the inner world."

At the same time as many contemporary photographers are looking inward,

others are interested in the ordinary facts of everyday life. What appears to be banal—as in the work of Plossu and Salbitani—is, in fact, profound. "The old trend of showing extraordinary things was a heritage from painting where you must show the Christ or a battle, etc. But photography can show the ordinary truth."

As with all art movements, Lemagny observed, part is in the past and part in the future simultaneously. In photography today, much excellent work is still accomplished in the reportage tradition.

"I think photography, to be recognized as an art," he summarized, "must have very definite trends. Art begins with differences. That's the reason we need more collections and exhibitions in Europe. There would be no art of painting if there were only Rembrandt. In Europe people know perhaps only Henri Cartier-Bresson, and that is not enough. In America photography is known as an art because there are books—you know Diane Arbus and you also know Paul Strand. And you have the works of all photographers in the museums and collections. When you see these differences between photographic works you begin to understand photography as art."

It occurred to me that another crucial ingredient in photography's evolution toward acceptance as an important art form is thoughtful and dedicated scholars such as M. Lemagny.—THE END





# view from Kramer

The universal lens mount: If it's so great, how come no one uses it?



It's been going on for decades now, the same procedure being repeated over and over again. If you buy a new lens for your view camera, chances are your dealer has no lens boards in stock for it. So he orders one

from the importer or distributor and you are lucky if you have it in a week or two. In case your camera is just a bit exotic, rare or old, you might have to wait months. And if your camera is a discontinued model, I as-

sure you that you will never get any lens board. Of course, one can be made for you, but at a considerable cost.

After you get your lens board, you must drop off the lens and the board at your local repairman to have the lens board drilled to the proper diameter and the lens fitted into it. It's all a big pain in the neck. If you own lots of lenses, as many view camera workers do, then this process is repeated over and over through the years. But this is only the beginning of the lens-board agony.

Suppose you own more than one view camera, and they take different boards. What happens then? Well, there are a number of things you can do. You can buy duplicate focal-length lenses and have one set mounted for each camera. But the cost is outrageous and it's too impractical. Here's another way out of the problem. Fit all your lenses on to the smaller board and have the bigger board adapted to take the smaller. That's not a bad solution. Now all your lenses can be used on many cameras. But the adapters are not as easy to find. And even if adapters were readily avail-



**Lens grabber:** Most iris diaphragms control light; this one holds lens in place!

able, they cost a pretty penny. I paid \$80 for an adapter for my Linhof Kardan that would take Linhof Technika boards ... plus the cost of remounting all my lenses on the Technika boards ... plus the cost of all the lens boards I needed!

I ended up with six empty Kardan boards and six lenses mounted on Technika boards ... at \$18 per board plus the cost of drilling and mounting. It gets insane after a while.

## Wood wouldn't fit

But here's one situation that stopped me cold. You see, I have three view cameras: a 4 x 5 Linhof Kardan, a 4 x 5 Nagaoka Field camera (luckily, it's the one that uses the Technika boards), and, here's the killer, a 5 x 7 Ansco View camera that takes huge wooden lens boards and isn't compatible with any other view cameras.

So, for a long time after solving (?) the problem with the two 4 x 5 cameras, I suffered along with the non-compatibility of the 5 x 7 Ansco. I really wanted to use many of the 4 x 5 lenses on the 5 x 7 (especially my 18.5cm Zeiss Protar), and there's nothing I regretted more than the fact that the 12-in. Artar on the 5 x 7 couldn't be used interchangeably on the 4 x 5 in a fast and easy manner.

But let's take this even further. I own a Durst 138 S enlarger. It's a lovely 5 x 7 monster that (you guessed it) takes view-camera-type lens boards. And I found that I had to have every lens individually mounted on a board. Since I test just about every enlarging lens that's made, it

*Continued on next page*

# FLASH!

IT'S THAT SIMPLE.



THE SUN NEVER SETS  
WITH A KONICA C35-EF. THE CAMERA WITH  
THE BUILT-IN ELECTRONIC FLASH.

## THE KONICA C35-EF

THE ONLY 35MM CAMERA  
WITH A BUILT-IN POP-UP  
ELECTRONIC FLASH.

Instead of lugging around flashguns, bulbs and cords, now you just press a button.

And you have a flash in a flash. Here's how it works: the built-in electronic flash rises above the camera. A neon lamp tells you you're ready.

Focus.

Shoot.

You get perfect flash pictures because the Konica automatically selects the correct lens opening for you as you focus.

The electronic flash gives a soft, color-balanced action freezing light, perfect for color or

black-and-white.

And for outdoor flash shots a unique computer mechanism measures just the right exposure for a beautiful fill-in light. Yet the background is totally free of that washed-out look you often get with outdoor flash.

Or, of course, shoot without flash anytime, and your exposure is set automatically by the sensitive CdS electric eye.

Remember the Konica C35-EF. It's the camera that won't let you forget your flash, because Konica remembered to build it in.

Ask your Konica dealer for a demonstration, or write for brochure.  
Konica Camera Company, Woodside, New York 11377.





**The Bigmouth  
developing tank.  
One of the new Vivitar  
darkroom accessories.**

Then you put a print in the developing tray. Or is that the fixer? Of course, they get mixed up because they look alike in the darkroom. **SOLUTION:** Color code the trays so you can tell the

Marketed in the U.S.A. by  
**Ponder & Best, Inc.** Corporate Offices:  
1630 Stewart Street, Santa Monica, CA  
90406. In Canada: Precision Cameras  
of Canada, Ltd., Montreal.



Since the opening is adjustable, it will allow you to mount any size lens and shutter up to the maximum diameter of the universal lens mount. The trick is to always get the largest universal lens mount that will fit on your camera lens board.

Prices of these units vary depending on where and when you buy them and from whom. I've seen them priced at from under \$14 for small ones to \$30 for the bigger jobs. But when you consider all the savings in time, convenience, cost and bulk, it's a bargain.—THE END



# NEW

## Color Photo Specialties

# INTERSTATE COLOR LAB, INC.

Look to Interstate Color Lab for the widest selection of professional photo specialties available anywhere. We're leaders in ready-to-hang custom hand enlarged prints from your 35mm or larger slides or color negatives... and in multiple print packages. Choose from the selections below. They're proven, effective methods of showing and selling your photos.



## BEAUTIFUL FRAMED PRINTS

From your 35mm or larger color negatives or slides

### 1620 CAMEO GALLERY



Professional 16x20 color print expertly cropped, color corrected, dodged, spotted. Mounted on tempered Masonite. Set in exquisite, deep relief hand rubbed Cameo frame. Two styles, two colors. Outstanding value. Introductory offer.

**\$29.95**

Frame finish and style:

- ☐ Antiqued white ☐ Antiqued Walnut  
☐ Oval (A) ☐ Rectangle (B)  
Available from neg. and slides 35mm or larger.

— 16x20 Cameo print (frame 22x26x3), \$29.95 ea.

P & H \$3.95 each

### 1620 GALLERY CANVAS



Same professional 16x20 color print and frame as 1620 Cameo Gallery at left, but print emulsion is stripped, pressure bonded to genuine canvas, stretched, and set in rectangular 1620 Gallery frame (22x26x3). A luxurious frame/print combination for landscapes and other texture-enhanced subjects.

**\$39.95**

- ☐ Antiqued White ☐ Antiqued Walnut  
Available from neg. and slides 35mm or larger.

— 16x20 Gallery Canvas @ \$39.95 ea.

P & H \$3.95 each

### EXHIBITOR 2024



20x24 custom print from 35mm or larger negative or slide. Silk finish. Dry mounted on heavy board. Framed in 2 1/4 inch walnut finished wood. Cropped, color corrected, dodged, spotted per your specs. Kodak paper.

**\$19.95**

- \$22.95 from slide  
— Exhibitor 20x24 \$19.95 ea.  
— From slide \$22.95 ea.

P & H \$2.00 ea.

### 16x20 CUSTOM



Custom color print, from your negative or slide. In handsome 1 1/2 inch walnut-finished wood frame. Cropped to your specs. Dodged, spotted. Kodak paper. Professionally dry mounted on heavy board.

**\$14.95**

- From slide \$17.95  
☐ SILK ☐ SEMI-GLOSS  
— 16x20 size \$14.95  
— Add \$3 if slide  
— 11x14 size \$10.00  
— Add \$3 if slide  
P & H \$1 ea. 11x14 \$2 ea. 16x20

## NEW CHROME FRAMED PRINTS

8x10, 11x14, 16x20, 20x24

Also, **COLORFUL VELOUR MATTED PRINTS**  
**Four Sizes**

In chrome, white or black frames. Choose mat colors (three) and frame colors (three) to match photo colors, room decor. Check coupon for literature.

### HEIRLOOM PICTORIAL



Custom designed for display. Rectangular or Oval to enhance subject. Vertical or horizontal.

|                  | Print | Frame | Price    |
|------------------|-------|-------|----------|
| Hand Enlarged    | 16x20 | 20x24 | \$22.95* |
| Machine Enlarged | 11x14 | 16x20 | \$6.95   |
| Machine Enlarged | 8x10  | 11x14 | \$6.95   |

\*From your color negative or slide. Professionally dry mounted then matted behind chocolate brown, textured matt board with gold liner. Color corrected and spotted. Solid wood frame with rich walnut finish. For 16x20 add \$3 from slide.

Rectangle ☐ Oval ☐  
P & H \$1 ea. for 11x14 frame; \$2 ea. 16x20, 20x24 frames

### EXOTIC PRINTS ON CANVAS



Artistic photographs... on canvas on board... or on canvas mounted on stretcher frame, set in walnut finish decorative frame (excluding 8x10). Add \$3.00 internegative charge from slide.

|         | (1)           | (2)           | (3)                | (4)              | (5)               | = Total |
|---------|---------------|---------------|--------------------|------------------|-------------------|---------|
|         | Add Custom    | Or Add Custom | Plus Mounting      | Or Plus Mounting | 2 or 3 columns    |         |
| Size    | Machine Print | Print Color   | (From Canvas Neg.) | On Board Canvas  | Stretched Columns | 4 or 5) |
| — 8x10  | \$1.25        | \$5.00        | \$9.00             | \$13.00          | =                 |         |
| — 11x14 | \$4.65        | \$10.00       | \$9.00             | \$13.00          | =                 |         |
| — 16x20 | N/A           | \$14.95       | \$12.00            | \$16.00          | =                 |         |
| — 20x24 | N/A           | \$19.95       | \$15.00            | \$19.00          | =                 |         |

P & H 10% per order

### BARNSIDE



New way to display photos. Mounted on Masonite offset from pine plaque.

| PRINT SIZE | PLAQUE SIZE   | PRICE   |
|------------|---------------|---------|
| — 3 1/2x5  | 5 3/8x6 5/8   | \$ 4.95 |
| — 5x7      | 7 1/8x8 7/8   | \$ 8.95 |
| — 8x10     | 11 1/4x13 3/4 | \$ 8.95 |
| — 11x14    | 15x18 1/2     | \$18.95 |

Mounted horizontal or vertical with hanging brackets.

STANDING EASEL \$2.50 ea.

GOLD LEAF LETTERING \$2.75 ea.

2 lines max. 25 characters per line. Example: "Photograph By..." plus your name. Additional Barnsides same imprint same order, \$25 ea.

P & H \$1 ea. for 3 1/2x5 and 5x7; \$2 ea. for 8x10 and 11x14

### 11x14 TAPESTRY



11x14 machine color print, tapestry finish. Color corrected, spotted. Mounted in a 1 1/2 inch walnut finished wood frame.

**\$5.95**

\$6.95 from slide

PRINT SURFACE

- ☐ SILK ☐ SEMI-GLOSS

— 11x14 Framed Tapestry \$5.95

— From your color slide \$6.95

P & H \$1 ea.

## MULTIPLE PRINT PACKAGES

### GROUP 'N ONE



Shoot a group, make extra sales by including individual shot with each group photo. Use GROUP 'N ONE packages for irresistible presentation.

| PACKAGE A                                      | ITEM DESCRIPTION                                                                                            | PACKAGE B                                      |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 1—7x5                                          | Color print of group                                                                                        | 1—10x8                                         |
| 1—3 1/2x5                                      | Color print of one                                                                                          | 1—5x7                                          |
| 1                                              | Double board self-standing mount, grey borders on white, with group or organization's name stamped in gold. | 1                                              |
| Plus P & H per pkg. (film processing included) | Max. 2 lines—25 Characters                                                                                  | Plus P & H per pkg. (film processing included) |

Shoot 135, 120 or 220 color neg. film: CX-CPS-VPS-Kodacolor II; or slide film: Kodachrome-Ektachrome-GAF-Dynacolor. Horizontal composition for group, vertical for individual. Min. 10 pkgs. 1 size.

— "Group 'N One" Package A, \$1.49 Ea.

— "Group 'N One" Package B, \$2.29 Ea.

P & H 10% first 100 or fewer ea. order

### PARTY PAC

A photo package for special occasions. 2—5x7 color prints. 2—Deluxe Photo Folders (plain or dance folders.) 4—Wallet prints. PLUS: FREE... We'll stamp your name or group's name on folders.

— \$1.79 processing included (Min. 20)

P & H 10% on first 100 or less pkgs. ordered at same time

WHAT FILMS TO SHOOT

135—20 or 36 Exp. 120—10 or 12 Exp. 220—20 or 24 Exp.

Color Neg. film only. CX-CPS-VPS-Kodacolor II.

IMPORTANT: All pictures on roll must be shot at same exposure with same lighting (no candids.)

SELLING DISPLAY KIT

To promote the Party Pac—Send most appealing special occasion neg. and we'll send you a special promotion package.

1—16x20 framed enlargement.

3 complete party packs with 2 dance folders, 2 5x7 prints and 4 wallet prints. \$20 value—Only

**\$12.00**

P & H \$1.00 per order



# INTERSTATE COLOR LAB, INC.



## Professional Film Processing for

We're the professional labs highly regarded and patronized by photo hobbyists and professionals around the world. We use Kodak equipment, Kodak paper and chemicals and Kodak trained technicians . . . to give you the finest film processing and printing available anywhere.

**SAVE**

**FILM & PHOTO VALUES**

### PROFESSIONAL COLOR NEGATIVE ROLL FILM PROCESSING

Kodacolor — Ektacolor CPS — Vericolor II  
Fujicolor — GAF — Kodacolor II  
**BORDERLESS PROOF PRINTS ON YOUR CHOICE**  
OF ☐ SILK (Y) or ☐ SEMI-GLOSS (N)  
Price includes processing your roll of film.

#### ROLL FILM SIZE 120

(Roll film size 220 — double 120 price)  
— 4x5 or 5x5 Prints, \$3.00 a roll\*  
— 5x7 Prints, \$5.65 a roll  
— 8x10 Prints, \$12.00 per roll  
Postage & Handling Add 10% (Min. \$.40)  
\*2 1/4x2 1/4 Negatives produce 5x5 prints.  
2 1/4x2 1/4 and 2 1/4x3 1/4 produce 4x5 prints.

#### ROLL FILM SIZE 35mm

Price includes processing your roll of film.  
— 3 1/2x5 Prints - 20 Exp., \$4.40 a roll  
— 3 1/2x5 Prints - 36 Exp., \$7.70 a roll  
— 5x7 Prints - 20 Exp., \$11.00 a roll  
— 5x7 Prints - 36 Exp., \$19.25 a roll  
— 8x10 Prints - 20 Exp., \$24.20 a roll  
— 8x10 Prints - 36 Exp., \$38.50 a roll  
Postage & Handling Add 10%

#### ROLL FILM 1/2 FRAME 35mm

— 2 1/2x3 1/2 - 20 Exp., \$6.60 a roll  
— 3 1/2x5 - 20 Exp., \$8.80 a roll  
— 5x7 - 20 Exp., \$22.00 a roll  
For 36 Exp. Rolls, double 20 Exp. price  
Postage & Handling Add 10%

### Professional Quality WALLET PHOTOS

Full Color — 2 1/2 x 3 1/2 — Borderless — Silk Finish  
Deluxe Rounded Corners  
Printed on Kodak paper from your color negative,  
CX - CPS - VS - C2 or 35mm color slide.  
In transparent dustproof reusable plastic container  
... packaging your customer will appreciate.

#### Cheaper By The Dozen

☐ 2 dozen (24), \$4.80 per order ..... \$  
☐ 4 dozen (48), \$8.64 per order ..... \$  
☐ 6 dozen (72), \$11.52 per order ..... \$  
☐ 12 dozen (144), \$20.00 per order ..... \$  
☐ 24 dozen (288), \$36.00 per order ..... \$  
Postage & Handling, add 10% per order \$

### MINIMUM ORDER — \$3.50

Total Amount of Order ..... \$  
Postage and Handling\* ..... \$  
Indiana Residents Add 4% Sales Tax ..... \$  
Total Amount Enclosed ..... \$  
\*Postage to foreign countries will be invoiced.  
☐ Send Film Mailer, Price List, Literature  
☐ Send Vericolor II Information Folder  
NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ APT. \_\_\_\_\_  
STATE & ZIP \_\_\_\_\_

PLEASE DO NOT MIX ROLL & REPRINT ORDERS IN SAME ENVELOPE.  
ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

## INTERSTATE COLOR LAB, INC.

P.O. BOX 246-ER • SOUTH BEND, INDIANA 46634  
Prices slightly higher at retail locations

RETAIL LOCATIONS: CHICAGO: First National Bank Plaza, 263-3559; Brunswick Bldg. 69 W. Washington St., 263-1395; Illinois Center Bldg. 111 E. Wacker Dr., 861-1207; INDIANAPOLIS: 1713 E. 52nd St., 253-8533; and 3508 S. Madison Street, 784-7122; SOUTH BEND: 1230 Mishawaka Avenue, 289-3000

### PROFESSIONAL COLOR NEGATIVE BORDERLESS REPRINTS

#### COLOR CORRECTED

on ☐ SILK (Y) or ☐ SEMI-GLOSS (N)  
120, 220, 35mm NEGATIVES

— 2 1/2x3 1/2 Prints @ \$.30 ea. (Min. 6)  
— 3 1/2x5 Prints, \$.35 ea.  
(from 35mm Negative only)  
— 4x5 Prints or 5x5, \$.55 ea.\*  
— 5x7 Prints, \$.75 ea.  
— 8x10 Prints, \$1.25 ea.  
— 11x14 Prints, \$4.65 ea.  
Postage & Handling Add 10% (Min. \$1.00)  
\*2 1/4x2 1/4 & 2 1/4x3 1/4 Negs. produce 4x5 prints.  
REMINDER: When ordering 8x10 and 11x14 prints from 35mm negatives or slide allow 1/4 of inch image loss from each end of negative.

### VIDEO ANALYZED PRINTS

#### KODAK'S NEWEST VIDEO ANALYZER

— 5x7 Prints, \$.95 ea.  
— 8x10 Prints, \$1.45 ea.\*  
— 11x14 Prints, \$4.95 ea.\*  
Postage & Handling Add 10% (Min. \$1.00)  
\*8x10 and 11x14 Prints only are available from 4x5 Vericolor and CPS sheet film.

### PROFESSIONAL COLOR SLIDE PROCESSING

#### Kodachrome - Ektachrome

— 20 Exp. roll, \$1.85 ea.  
— 36 Exp. roll, \$2.80 ea.  
Postage & Handling Add 10%

### PUSH PROCESSING

For push processing High Speed Ektachrome 160 ASA to 400 ASA, add \$2.00 to regular processing price.

### PROFESSIONAL BORDERLESS PRINTS FROM SLIDES

Direct Color Prints, Silk Finish,  
On Kodak's Ektachrome Print Material

Beautiful, brilliant, low-cost  
color controlled prints.

— 2 1/2x3 1/2 Wallet Prints, \$.30 ea.  
(From 35mm Only)  
— 3 1/2x3 1/2 or 3 1/2x5 Prints, \$.40 ea.  
— 5x5 or 5x7 Prints, \$.85 ea.  
— 8x10 Prints, \$1.60 ea.  
— 11x14 Prints, \$4.95 ea.  
Postage & Handling Add 10% (Min. \$1.00)

## 35MM USERS

Your 35mm film is untouched by hand during its entire visit at our professional color lab. It's one of our service exclusives.

Highly skilled technicians do, however, give it intense visual attention as it moves through our specially designed, Kodak licensed, automated developing, processing, printing and packaging operations.

Your negatives are cut in strips of four, enclosed in a soft reusable protective plastic sleeve and hurried to you matched with their borderless silk or semi-gloss prints. We promise you'll find them free of scratches, dust, moisture, curling . . . and fingerprints!

For a unique combination of personal interest and professional automated or custom 35mm film processing and finishing, send your order to us. We care.

### MOVIE FILM PROCESSING

— Super 8mm, \$1.95 a roll (50 ft.) ..... \$  
— Super 8mm Ektachrome 160  
(available light) silent or sound  
(50 feet), \$1.95 ..... \$  
Postage & Handling Add 10% (Min. \$.20) .....

### READ THIS NOTICE!

The return of any film or print to us for processing or any other purpose, constitutes an agreement by you that if any such film or print is damaged or lost by us it will be replaced with an equivalent amount of unexposed film and processing. Except for such replacement, the handling of such film or prints by us is without warranty or liability even though damage or loss is caused by negligence or other fault.



### SALON MOUNTS

Professional dry mounting on heavy colored board. Specify how you want your print mounted or leave to our best judgment.

#### MOUNTING BOARD COLORS

☐ White ☐ Grey ☐ Red ☐ Blue  
☐ Black ☐ Dk. Brown ☐ Green

| No. | (1) Print Size | (2) Board Size | (3) Mounting Price | (4) Plus Price of Machine Print | (5) Or Plus Price of Custom Print (From Color Negative) | = TOTAL (from column 3 plus columns 4 or 5) |
|-----|----------------|----------------|--------------------|---------------------------------|---------------------------------------------------------|---------------------------------------------|
| —   | 8x10           | 11x14          | \$2.00             | \$1.25                          | \$5.00*                                                 | \$                                          |
| —   | 11x14          | 16x20          | \$3.00             | \$4.65                          | \$10.00*                                                | \$                                          |
| —   | 16x20          | 20x24          | \$4.00             | N/A                             | \$14.95*                                                | \$                                          |
| —   | 20x24          | 24x30          | \$6.00             | N/A                             | \$19.95*                                                | \$                                          |

\*Add \$3.00 internegative charge if from slide.

Postage and Handling Add 10% ..... \$

### HOT STAMPING (Most Any Item)

Personalize for the Professional Touch. Imprint your studio name or your client's name on prints, salon mounts, pictorial mounts or folders. "Photography By" plus name set in type, or gold stamp the picture occasion, "Class of 1975", etc. Two lines maximum with 25 characters per line (including spaces).

Imprint Color: ☐ Gold ☐ Red ☐ Blue  
— Number of imprints @ \$.25 ea. .... \$  
— Set up charges per job @ \$2.50 .....



**QUALITY****CUSTOM &  
AUTOMATED  
FINISHING****INTERSTATE COLOR LAB, INC.**

# the Discriminating Photographer

Choose from our many custom or automated finishing services. In a short time you'll enjoy prints or slides with all the beauty of your original exposure. Join our more than 100 thousand customers the world over. Send your order today.



## Custom Finishing

- Prints cropped to your specifications
- All prints hand enlarged
- Your choice of printing paper
- Wide variety of special services

## CUSTOM COLOR PRINTS

Paper choice: ☐ SILK (Y) or ☐ SEMI-GLOSS (N)  
Add \$3.00 if from slide.

- 8x10 Prints, \$5.00
- 11x14 Prints, \$10.00\*
- 16x20 Prints, \$14.95\*
- 20x24 Prints, \$19.95\*

Postage & Handling \$1.00 ea. for 8x10, 11x14; \$2.00 ea. for 16x20 & 20x24

\*Framed in solid wood frame.

## QUANTITY COLOR PRINTS

**Professional Quality**  
**75¢ ea. 8x10**

500 and up from single color negative  
Fully corrected color prints on Kodak paper.  
Printed from your color negative,  
CX - CPS - VPS - C2 or 35mm color slide\*  
Quan.

- 500 & up, 75¢ per print
- 250 to 499, 80¢ per print
- 100 to 249, 85¢ per print

\*When printed from color slide  
add \$3.00 for internegative  
Postage & Handling, add \$2.00 per order

**YES, we do professional printing from 110,  
126, 127, 620 color rolls. Write for price.**

## PROFESSIONAL CUSTOM-QUALITY BLACK & WHITE PROCESSING

FEATURING Fine grain film developing, custom hand printing, dodging and burning, quality Kodak chemicals and papers.

Please check paper surface desired.

☐ GLOSSY ☐ SILK ☐ SEMI-GLOSS ☐ MATTE

## ROLL FILM PROCESSING AND PRINTING

NO. ROLLS

- 10 Exp. roll 4x5 prints @ \$3.50 set
- 12 Exp. roll 5x5 prints @ \$5.00 set
- 20 Exp. roll 3 1/2 x 5 prints @ \$6.00 set
- 20 Exp. roll 5x7 prints @ 9.00 set
- 36 Exp. roll 3 1/2 x 5 prints @ 11.00 set
- 36 Exp. roll 5x7 prints @ 16.00 set

Above prices include film processing.  
Postage & Handling Add 10%

## CUSTOM BLACK AND WHITE ENLARGEMENTS

Cropping to your specifications or the judgment of our professionals. Please check choice of paper.

QUAN.

- 5x7 prints @ 2.00
- 5x7 prints & Flush Dry Mounting @ 3.00
- 8x10 prints @ 3.00
- 8x10 prints & Flush Dry Mounting @ 4.50
- 11x14 prints @ 5.00
- 11x14 prints & Flush Dry Mounting @ 6.50
- 16x20 prints @ 8.00
- 16x20 prints & Flush Dry Mounting @ 10.00

NOTE — Dry mounting of prints is professionally done on white board.  
Postage & Handling Add 10%

## WEDDING EFFECTS

Add excitement to your prized wedding shots. Salvage less-than-perfect compositions. Mask with champagne glass, heart, oval, cross, keyhole or sheet music (bridal chorus from "Lohengrin") effects. Image must be vertical format. Available for 8x10, 11x14, 16x20 prints.



Please circle  
desired effect

— Wedding effects, \$2.50 each (Plus Custom Color Print Price Above)

## NEW KODAK VERICOLOR II PROFESSIONAL FILM — BUY FRESH ROLLS IN BULK... SAVE \$ \$

| No. ROLLS | TYPE & SIZE | 20 ROLLS | 10 ROLLS | 5 ROLLS | TOTAL |
|-----------|-------------|----------|----------|---------|-------|
| —         | VPS 135-20  | \$35.60  | \$18.50  | \$ 9.75 | \$    |
| —         | VPS 135-36  | 46.00    | 25.00    | 14.00   | \$    |
| —         | VPS 120     |          |          |         |       |
| —         | Pro Pack*   | 26.00*   | 14.00*   | 8.00*   | \$    |
| —         | VPS 220     | 53.00*   | 28.00*   | 15.00*  | \$    |
| —         | Pro Pack*   |          |          |         |       |

\*Pkgd. 5 rolls/ctn.

### KODACOLOR II FILM

|   |         |       |       |       |    |
|---|---------|-------|-------|-------|----|
| — | C135-20 | 28.00 | 14.75 | 7.60  | \$ |
| — | C135-36 | 38.00 | 20.00 | 10.35 | \$ |

### Film Shipped Same Day Order Received

Add Postage & Handling. U.S. orders via Special Handling or UPS. Others air.

| QUAN.<br>(Rolls) | U.S.<br>CANADA<br>MEXICO | CENTRAL<br>AMERICA | SOUTH<br>AMERICA<br>EUROPE | FAR EAST<br>AFRICA<br>AUSTRALIA |    |
|------------------|--------------------------|--------------------|----------------------------|---------------------------------|----|
| 20               | \$1.75                   | \$2.75             | \$4.75                     | \$6.25                          | \$ |
| 10               | \$1.25                   | \$2.00             | \$2.75                     | \$3.75                          | \$ |
| 5                | \$1.00                   | \$1.25             | \$1.75                     | \$2.00                          | \$ |

### READ THIS NOTICE!

The return of any film or print to us for processing or any other purpose, constitutes an agreement by you that if any such film or print is damaged or lost by us it will be replaced with an equivalent amount of unexposed film and processing. Except for such replacement, the handling of such film or prints by us is without warranty or liability even though damage or loss is caused by negligence or other fault.

### MINIMUM ORDER — \$3.50

Total Amount of Order ..... \$  
Postage and Handling\* ..... \$  
Indiana Residents Add 4% Sales Tax ..... \$  
Total Amount Enclosed ..... \$  
\*Postage to foreign countries will be invoiced.

- ☐ Send Film Mailer, Price List, Literature  
☐ Send Vericolor II Information Folder

MP276

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

APT. \_\_\_\_\_

STATE & ZIP \_\_\_\_\_

PLEASE DO NOT MIX ROLL & REPRINT ORDERS IN SAME ENVELOPE.  
ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

## INTERSTATE COLOR LAB, INC.

P.O. BOX 246-ER • SOUTH BEND, INDIANA 46634

Prices slightly higher at retail locations

RETAIL LOCATIONS: CHICAGO: First National Bank Plaza, 263-3559; Brunswick Bldg. 69 W. Washington St., 263-1395; Illinois Center Bldg. 111 E. Wacker Dr., 861-1201; INDIANAPOLIS: 1713 E. 52nd St., 253-8533; and 3508 S. Madison Street, 784-7122; SOUTH BEND: 1230 Mishawaka Avenue, 289-3000

VISITORS 1230 Mishawaka Ave.  
WELCOME South Bend, IN  
Hours: 9 to 4 Phone 219/232-9931

## It's New... Try It... KODAK VERICOLOR II PROFESSIONAL FILM — 3 WAYS BETTER

- Better enlargements with finer grain and greater sharpness. From 35mm, for instance, your 8x10's can be exceptionally sharp and crisp. And you can get still bigger prints with unusual sharpness and minimal grain.
- Improved flesh tones, more accurate colors, neutral gray tones. More than ever like the tones and colors of the subject.
- Higher quality prints from marginal negatives. Greater exposure latitude gives better prints from both overexposed and underexposed negatives. Watch particularly for better color in dark areas such as backgrounds of candid shots with flash.

Our regular roll film processing and printing prices apply.

See Vericolor II film order form above.



# ask for it

Got the latest dope on the camera you're interested in buying? Just circle the item number on the coupon and send it to us plus 15c for each item to cover mailing and handling.

## LENSES AND BINOCULARS

- 401.** The **SAMIGON** Auto Tele Plus 2X Converter is described in a foldout brochure. Data on what it does and how to use the converter is included.
- 402.** Different **SAMIGON** interchangeable lenses, and zoom systems are listed along with filters and adapters available. Prices given.
- 403.** **SOLIGOR** optics brochure contains information on T4, auto, pre-set lens systems, and other accessories in Soligor line.
- 405.** **YASHICA** has made available a new 54-page booklet describing all Yashinon lenses and accessories for Yashica SLR's.
- 406.** The **LEITZ** 88mm Telyt-S f/6.3 for reportage, sports, and wild life photography is discussed in a new brochure.
- 415.** **LEICA** f/6.8 400mm/560mm lens guide is now available with full technical data.
- 417.** Technical information from **PHOTO IMPORTS** on **KOMURA** interchangeable lenses for Bronica mount and adaptor for Rollei SL66.
- 425.** Brochure from **FUJI** discussing the virtues of 11-layer electron beam coating on its full line of Fujinon lenses.
- 426.** Catalog from **PRINZ** includes its complete line of lenses and filters, with illustrations of actual results.
- 430.** For the ultimate in telescopic photography, brochure describing **THE QUESTAR**—standard & new field models—is a must. Illustrated, with prices, accessories, and services.
- 434.** An information kit from **SWIFT** consisting of brochures on its varied line of binoculars.
- 435.** A technical flyer gives details of the complete line of **YASHICA** auto Yashikor lenses.
- 439.** Brochure on **KERN** Swiss Binoculars from 8x18—7x50, telescopes and Kern Switar movie lenses.
- 441.** Brochure describing the **CAM-ROD** line of lenses, tele converters, and special photo accessories for most cameras. Full technical data and test reports included.
- 443.** Brochure describing **SAMIGON'S** quality optics and lens accessories for SLR photography, illustrated with complete specifications.
- 444.** Brochure from **TIFFEN** describing its extensive line of lens accessories, illustrated with charts, tables, and technical specifications.

- 445.** The complete line of high quality binoculars from **YASHICA**, regular and wide angle, described fully in new brochure.
- 447.** Technical specifications and illustrations for the Trinovid line of **LEITZ** binoculars contained in new booklet.
- 448.** Technical charts and specifications included in a new brochure discussing **CANON FD LENSES**.
- 450.** The line of **RITZ** lenses is described fully in a new booklet now available.
- 455.** The complete line of **VIVITAR** automatic fixed mount lenses is discussed in a technical brochure.
- 457.** A guide to automatic tele converters for 35mm SLR cameras is now available from **VIVITAR**.
- 459.** Booklet illustrates how **HONEYWELL** super-multi-coated Takumar lenses can add new dimensions of 35mm SLR photography.
- 460.** Brochure describes **HONEYWELL** Lumetar telephoto mirror lenses which adapt to most 35mm SLR cameras.
- 461.** A brochure from **PHOTO IMPORTS** containing technical specifications on its line of **KOMURA** Tele-more multi-coated converters.
- 462.** Brochure describing the **VIVITAR** TX interchangeable lens and adapter system. The system consists of a wide range of lenses from wide angles to telephotos to zooms.

## CATALOGS & MISCELLANEOUS

- 900.** **BERKEY MARKETING** has made available an information kit which includes descriptive literature on the **GOSSNER** meter, the full line of **KONICA** cameras, the **MINOX** ultraminiature camera, the **TAMRON** automatic lens system, the **ZERO-HALLIBURTON** carrying cases, the **SIMMON OMEGA** line of enlargers and accessories, **LINHOF** cameras, and **RODENSTOCK** lenses.
- 903.** "The **CANON** Story" is the theme of a new catalog discussing the complete line of cameras and lenses.
- 907.** Literature on **HAHNEL** splicers and editor/ viewers (dual 8, super 8 and 16mm).
- 916.** Color brochure offers suggestions for using **GAF** Color Slide Films, ASA 64, ASA 200, and ASA 500.
- 923.** The full **YASHICA** line of still and movie cameras fully illustrated and outlined.
- 949.** Texture Samples and price list for custom color enlargements and other services available from **STORMY DAWN COLOR LABS**.
- 955.** Full color brochure and price list outline the operation of **MINOLTA** Autopak AFT/2 and Autopak AF/2 auto-focus slide projectors.
- 956.** Staticmaster from **NUCLEAR**, for cleaning transparencies, lenses, filters, and negatives, is described and illustrated in new brochure.
- 958.** The complete line of **COPAL** digital clocks is illustrated and discussed in a new brochure.
- 960.** The **RITZ** line of accessories, lenses and attachments for camera and darkroom is discussed in its 1975 catalog.
- 961.** Information on **HONEYWELL'S** new custom photo shop, featuring photo equipment modifications and custom-built products, described in new brochure.

|                                                                                        |  |     |     |     |     |
|----------------------------------------------------------------------------------------|--|-----|-----|-----|-----|
| To: <b>MODERN PHOTOGRAPHY</b>                                                          |  | 401 | 402 | 403 | 405 |
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|                                                                                        |  | 455 | 457 | 459 | 460 |
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|                                                                                        |  | 568 | 569 | 570 | 571 |
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|                                                                                        |  | 971 | 973 | 974 | 975 |
| ZIP _____                                                                              |  | 976 | 978 | 979 |     |

- 966.** Brochures from **ILFORD** describing its line of black and white films: Pan F, FP4, and HP4.
- 968.** **AMPHOTO'S** complete 1975 catalog of photo books. List price \$1.00—25c to Modern Photography readers. Mail To: Amphoto, Dept. M, East Gate & Zeckendorf Bldgs., Garden City, N.Y. 11530.
- 969.** **PORTERS** has made available its 1975 catalog of the extensive Portertown line of photographic accessories and items.
- 970.** "Capture The Sea With Your Camera" is the theme of a new catalog from **IKELITE**. Complete line of underwater systems illustrated and discussed.
- 971.** Instructions on the preparation and processing of **GAF** color slide film is the theme of a new brochure which includes descriptions of three different speeds of film.
- 973.** Sample copy of The Camera Craftsman, featuring latest developments in phototechnology, available from **NATIONAL CAMERA**.
- 974.** **NATIONAL CAMERA** has made available a camera parts and service manual on microfilm. List and information available.
- 975.** 80-page catalog listing film, processing equipment, supplies and information for the movie and 35mm fan is available from **SUPERIOR BULK FILM**.
- 976.** **SOLAR CINE** 74-page Photographic Reference Buying Guide featuring cameras, projectors, enlargers, accessories, and photographic services for individuals, schools, and businesses.
- 978.** The latest edition of **FRANK'S** photographic discount catalog now available.
- 979.** For the **LAUREL** Photographic Books 1975/76 Catalog, mail \$1.00 to Laurel, P.O. Box 956, Melville, N.Y. 11746 (the \$1.00 will be applied towards first purchase).

## DARKROOM EQUIPMENT

- 501.** Complete price list and technical specifications from **ILFORD** on Ilfo-brom enlarging paper and Ilfoprint stabilization paper.
- 502.** Color printing data sheet from **BESELER** contains color processing tips, and includes information on obtaining long print life.
- 504.** A beginners Darkroom Guide is now available from **PATERSON**. The whole process of developing a black and white film is fully described and illustrated.
- 506.** **TESTRITE** enlargers, tripods, copy equipment darkroom supplies and lighting equipment are featured in a new 36-page, 54th anniversary, illustrated catalog.
- 531.** Information kit and buyer's guide on the **BESELER** color analyzers, giving complete technical specifications, now available.
- 532.** Booklet illustrates advantages of **BESELER'S** 23C enlarger for all color or black & white printing from negatives up to 2 1/4" x 3 1/4".
- 533.** Brochure describing the key features of **VIVITAR** Bigmouth developing tanks, developing trays, and other darkroom accessories.
- 540.** "The Ilfoprint System" from **ILFORD** (papers, chemicals, and processors) fully described in new fact sheet.
- 547.** The new **RITZ** catalog spotlights its line of materials and equipment for the darkroom.
- 548.** Darkroom catalog discussing the complete **BOGEN** line of enlargers, lenses, dryers, tanks and other darkroom aids.
- 559.** Complete specifications for the **VIVITAR** line of precision enlargers contained in latest technical brochure.
- 560.** Brochure and price list describe operation of the **MINOLTA** Color Enlarger System. Including filter-drawer module, dichroic filter module, color analyzer and accessory system.
- 561.** **HONEYWELL** darkroom booklet describes the line of Honeywell Nikor and Honeywell/Wein products and accessories. Also includes Sable 1 color printing machine.
- 562.** The **BROOKS** line of Dark Room Aids is discussed in a new information kit. Runs the gamut from enlargers to sinks.
- 568.** **HP MARKETING** has a technical fact sheet on two new models of Meopta enlargers: Axomat 3 & Opemus 4.
- 569.** The **BESELER** UltraFin black & white high resolution developers and other chemicals discussed in new brochure.
- 570.** Brochure details all products in the **COLOR BY BESELER** 2-step color printing system.
- 571.** Hundreds of darkroom items are listed in **PORTER'S** new K-15 catalog.
- 572.** The Cibachrome Color Print System for amateurs completely described in a new brochure from **ILFORD**.
- 573.** A booklet describing the full line of **PATERSON** darkroom equipment for enlarging, film processing, printing, etc.
- 574.** **SAMIGON** enlargers, enlarging accessories, and other darkroom accessories are described and illustrated in brochure.
- 575.** Recommended film developing procedure; **576.** Facts about fixers; **577.** Developing photographic papers. Separate information kits available from **EDWAL**.

MORE ASK FOR IT  
on page 146



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356. *Photographic Lighting* by Woolley. List \$10.95.



527. *Nudes of 16 Lands* by S. Rothman. List \$15.00.



137./391. *Ultra Miniature Photography & Camera's Choice; Children* (Counts as 1 book). List \$17.90.



0467. *Lootens On Photographic Enlarging & Print Quality*. List \$12.95.



534. *Victor Keppler-Man + Camera*. (with Slip Case.) List \$19.50.



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489. *Practical Portrait Photography* by Falk & Abel. List \$12.95.



462./512. *How To Use Variable Contrast Papers & Electronics For Photographers* (Counts 1 book). List \$16.90.



0526. *Fine Figure Photography* by Santucci. List \$13.95.



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- Photoguide To Home Processing by Jacobson. List \$8.95—Club Price \$7.95.
- Photoguide To Effects & Tricks by Spitzing. List \$8.95—Club Price \$7.95.

- Successful Wedding Photography by Arin. List \$10.95—Club Price \$8.95.
- Kodak Advanced Photo Book Collection. List \$14.25—Club Price \$10.95.
- Darkroom Magic by Otto Litzel. List \$10.95—Club Price \$8.50.
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MP-276

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### INSTANT PICTURES

Continued from page 41

eye had been running a double check on me, prematurely closing the shutter after it had read enough light in the scene to make the correct exposure setting.

The eye had read the brilliance of the flash reflected from the mirror; outdoors, when I had matched the setting for a day-light exposure, it didn't fire the flash at all. I got the strange feeling that the camera was saving me the cost of a bulb, and that I should have told it somehow that I was experimenting with exposure settings.

I took my pictures and conclusions to Cambridge and found that, indeed, the electric eye had been incorporated into the follow-focus flash system to compensate for inaccurate focusing that would result in poorly exposed pictures, but it included a few innovations that I hadn't thought of. While you still choose the aperture by focusing, the electric eye decides on the exposure time. This still allows for the wide range of apertures needed for making photographs from 10.4 in. to beyond 15 ft.

Polaroid's electronics designers first increased the exposure for flash at all settings by bringing the aperture at the top of the range back to f/70 from f/96 (with the setting at 10.4 in.) and moved the maximum aperture of f/8 back to about 11 ft. from about 17 ft., which is an increase in exposure of approximately 3/4 stop at each distance. This change virtually eliminated any underexposures under normal conditions.

After seemingly creating an over-exposure for all flash pictures, the electric eye, replacing the fixed shutter speed, will close the shutter when it has seen enough light in the scene, or keep it open for the full duration of the flash.

You are better able to trim your exposures manually with the new system by overriding the eye with the Lighten/Darken control, wherein each mark represents, as on all Polaroid cameras, about 1/2 f/stop. You may need this control to overcome the one drawback in this system: a strong light or dark object dominating the composition. A white blouse can reflect enough light to cause the eye to close the shutter too soon for a good skin tone. A dark sweater can likewise fool the eye into overexposing the face. Remember that the eye sees an area somewhat larger than a silver dollar slightly above the center of the finished print.

Focusing had been an all-too-critical step in the follow-focus system for the novice who might focus on any object, near or far, that he saw in the viewfinder. In his excitement to see the picture he didn't want to be bothered with a lengthy explanation of why the position of his focus would determine the lightness or darkness of his final picture. To him the two settings (focusing and aperture) simply did not go together.

While the snapshooter may be getting better exposures with his reflex camera (Models 1 and 2), Polaroid has extended its SX-70 line to include the less expensive Model 3, on which the flash-to-subject distance is estimated and set separately on the camera. I wouldn't be surprised to see a solid, plastic-body non-folding model of the SX-70, like the old Colorpack cameras, in the future. (Incidentally, the

Continued on page 148





filling the needs  
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*For more information about this and many of our other fine products, please turn to the Ritz ad on page 129.*



available for:  
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80-220mm F 4.5

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Zoom lenses were first used on motion picture cameras, where sharpness requirements do not approach those of still photography. It was assumed for years that it was optically impossible to make a zoom sharp enough for a still image. In fact, many photographers continue to believe this. They are photographers who have not experienced a Nikkor Zoom.

The first roll of film is always a revelation. It is sharp. Literally, as sharp as the best of regular fixed focal length lenses. With myriad other advantages as well.

The famed 80-200mm f4.5 Zoom Nikkor, for example. It is no longer than a regular 200mm Nikkor, weighs just slightly more, and focuses a foot closer. Naturally, it also costs considerably more...but, in many applications where there is ample light, it eliminates the need for 85mm, 105mm and 135mm lenses as well. For it gives you all of these focal lengths, and everything in-between, continuously in-focus, with a subtle movement of the zoom/focus collar. Perfect for any kind of action, sensational for travel.

#### **New 28-45mm Zoom Nikkor**

The world's widest-angle zoom is just becoming available. It is, of course, a Nikkor. Still another optical breakthrough was required of Nikon designers to make the 28-45mm f4.5 Nikkor a reality. For, until now, it was always thought that the retro-focus ("inverted telephoto") design could not be applied to a zoom. It can, it has been, it is phenomenally good. Combined with the economical 43-86mm f3.5 Zoom and the 80-200, it

covers the entire most-used range of focal lengths.

Another Nikkor Zoom practically does that by itself. A few years ago, Nikon astounded the world with the longest zoom range in still photography. The record still stands: 6-times. The incredible 50-300mm f4.5 Zoom Nikkor. When size is not a problem, it can do amazing things.

There is also a 200-600mm f9.5 Nikkor Zoom, and two more long ones on the way: a 180-600mm f8, and a 360-1200mm f11!

#### **Mechanics as good as the optics**

In any lens, the optical quality is very much dependent on the mechanical quality. For the focusing and aperture mechanisms can have an equally important effect on the image. This is doubly true in a zoom lens, with its complex system of shifting elements. A zoom lens is the last place in the photographic world to economize!

We don't, at Nikon. Not only are the materials and the precision with which they are assembled of the highest order, but we even consider how various materials will interreact in temperature extremes! As a result, a Zoom Nikkor, any Nikkor, will function smoothly, precisely in arctic cold, desert heat and after years of use. Which is just one example of why Nikkor Lenses are more than 50 of the very best reasons for owning a Nikon or Nikkormat camera! Ask your dealer for the details and a demonstration. Nikon Inc., Garden City, New York 11530. Subsidiary of Ehrenreich Photo-Optical Industries, Inc., (In Canada: Anglophoto Limited, P.Q.)

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Cover the news around

the corner, or around the world. Newspapers, magazines and trade papers simply can't get enough good material. Work as a staff photographer or free lance. As long as news is made, you'll never run out of photographs to take . . . and sell!

**Fashion Photography.**  
Fashions change constantly, and that means a never-ending demand for fine fashion photography. Work with some of the most beautiful models in the world, in lush surroundings. The top-flight professional can command big fees in this fascinating, highly artistic field.

**Theater and Motion Pictures.** Get to know famous actors and

actresses. Make photographs for publicity, advertising, lobby displays. The well-trained, enterprising photographer can make this a profitable, full-time career.

**Portrait Photography.**  
There is a great market for portrait photographs of business, political and diplomatic leaders. But *everyone* is a potential subject and sale. For anniversaries, birthdays, new babies, special occasions. A fine portrait photographer is always in demand.

**Weddings.** What's a wedding without a photographer? Wedding photography is fun . . . and profitable. Not only do you take a lot of pictures, but there are

also orders for extra prints. You can build a career in this one field alone.

**Science and Industry.**  
Almost an unlimited number of opportunities for the trained photographer here. Work in such areas as medicine, astronomy, physics, biology, metallurgy, microscopy and chemistry. Take photographs for slide films, house publications. Crime photography, too, is a growing field.

**Glamour.** Just look over the magazine stands to measure the size of this market! If you know the right way to pose, light and "shoot" a beautiful girl, you can find a ready sale for your work.



# ...with your camera!



**Commercial and Advertising.** Practically every product and service on the market today uses photography to help get sales messages across to customers. The photographer who can show the product or service to its best advantage—in newspaper, magazine, direct mail and brochure advertising—can command almost his own price.

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## .tech- niques tomorrow by Bennett Sherman

Light falloff of lenses: it's all quite simple (see pages 88-93) except for the Cosine Fourth Law. That's important too, and it's a dilly.



We're breaking virgin ground this month in lens testing. As you can see in Hiroshi Kimata's article on page 88 of this issue ("How Much Lens Light Falloff Is Too Much?"), we are going to measure and chart the actual

exposure falloff for all lenses we test. In the article, we've given four major reasons for this light loss and explained them rather completely. But the second most important cause of this falloff is so important that MODERN saddled me with the task of explaining it. It's called the "Cosine Fourth Law." Here's how it works.

Pick up the lens from an SLR and look at its front. With a brightly illuminated piece of white paper behind the lens, you'll see a white circle which is the entrance pupil of the lens. You'll notice that the front element is larger than this circle, and it should be. This is the way a lens must be designed so that light can go through to image points at the edges and corners.

Now let's look at the theoretical loss called the "cosine-fourth law." In the mathematics of trigonometry there are special numbers or functions related to angles which vary in a regular pattern as the angle value changes. One of these is called the cosine. For an angle of 0°, the value of the cosine function is 1.00. When the angle increases to 90°, the cosine value drops to zero. In between, the cosine changes slowly for angles near zero, but more rapidly as the angle increases above 30°. It turns out that the light falling on the flat film surface depends upon the cosine of the off-axis angle in the camera.

Pick up the camera lens again and turn it around so that the brightly illuminated white paper can be seen through the lens from the back. Again, a white circle of light can be seen. This is the exit pupil of the lens. Now, consider the exit pupil of the lens to be a flat circular disk of light, sending its illumination toward the film. If you turn the lens a little, you'll notice that the circle appears to shrink somewhat into the shape of an ellipse. This means that the illumination toward the edges and corners of the film is less, and is reduced by an amount exactly dependent on the cosine of the off-axis angle. However, there's more.

Imagine one line drawn from the center of the exit pupil to the center of the film,

*Continued on page 60*

5247

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## TECHNIQUES TOMORROW

Continued from page 58



**Entrance pupil:** Head-on view shows large front element through which light enters.



**Exit pupil:** Turn lens around. Pupil at rear is smaller but still circular, so that light reaches all parts of film evenly.



**Vignette:** Turn lens sideways, and exit pupil shrinks to ellipse, effectively cutting off light headed for corners and edges.

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and another line drawn from the center of the exit pupil to the corners of the film plane. The angle between these lines is the off-axis angle to the corner. The distance from the exit pupil to the corner is greater than the distance from the exit pupil to the center of the film plane. This causes a drop in illumination for the corner. The actual amount of loss is dependent on the cosine-times-the-cosine, or the cosine squared. Multiply this loss by the loss caused by the elliptical shape of the pupil for the light going toward the corner of the film plane, and we get a total loss equal to the cosine cubed, or the cosine multiplied by itself twice. For example, the cosine of an angle of 30° is .866. Multiply this by itself twice and we get .649. This means that the light falloff due to the cosine cubed is almost a full stop. (A

Continued on page 64





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# The Vivitar Complete Light Machine- a systems approach to portable electronic flash.

## The basic Vivitar 283



## The Vivitar 283 System





The basic premise behind the 283 System is that it's easier and more satisfactory to change the nature of light at the source rather than in the camera. So the 283 gives you a terrific variety of options in the control of light. It lets you change direction, color, intensity, and angle of coverage...simply the most sophisticated and versatile portable flash system available.

## 1 What it does.

Let's look at the 283 in use. You're shooting with Kodachrome 25 and your 283 is in the automatic mode. You have a choice of 4 f/stops (f1.4, 2, 4, and 5.6) for depth of field control. (If you were shooting with ASA 100 film, your stops would be f2.8, 4, 8, and 11). You want to use bounce light on your subject, and angle a bit too. **1a** The remote sensor is on the camera and connected by its cord to the flash unit 3 feet at camera left. You're going to bounce the light off the ceiling, so you decide whether to use the 45, 60 or 75° click stop bounce position for the flash head. As you set it, the BCC Bounce Compensator Circuit tells the sensor to adjust itself to compensate for possible under exposure due to bounce fall-off and to "open up" the shadows caused by light coming from above. You push the open flash button, your flash fires, and you look at the built-in LED indicator. It's on for a second and you know you've got a proper exposure. All you've done so far is use the basic 283 flash unit. Now read on...

## 2 Power Sources

The standard power source for the 283 is 4 AA alkaline batteries in a special battery holder. Extra holders are available, so you can carry fresh back-up batteries ready



to reload in an instant. Expect 75 to 800 flashes with one set

of batteries. Recycle time is 0.5 to 9.0 seconds.

Optional equipment for the 283 includes an SB-4 AC Adapter for use when there's a house current (105V-125V) outlet handy.

Another optional power source is the NC-3 NiCad Battery Pack. The NC-3 recharges in only 15 minutes



in Vivitar's new "Charge 15," a fully automatic external charger. A "charging" indicator light goes off to tell you the pack is recharged.

## 3 High Voltage Battery Pack

Our other new power source is the HVP-1 High Voltage Battery Pack Regulator. The HVP-1 converts a 510 volt photo battery to the 330 volts the 283 requires and maintains that voltage to plus or minus 10 volts, the equivalent of better than 0.25 f/stop. Recycle time is 0.5 to 1.5 seconds. In manual operation, you'll get up to 1,000 flashes. And in automatic operation, you may wear out before the battery does.



## 4 Flash Lens Adapter

This precisely engineered attachment snaps on over the flash head. It positions Vivitar Flash Filters and Vivitar Variable Angle Flash Lenses at an exact distance from the head. Once you have this adapter and the Vivitar filters and lenses, you can do things with flash you never thought possible.

## 5 The Soft Bounce Reflector

Here's a lightweight holder that snaps onto the 283 and



allows you to take perfectly controlled bounce/soft light portraits, or still life studies. You use the back of a Kodak grey card and get a standardized 90% white reflectance so its effect is totally predictable. Used in combination with color filters, gives soft, colored bounce light.

## 6 Variable Angle Flash Lenses

Wide Angle and Telephoto Flash. Two lenses for wide angle, two for telephoto. The



extra wide angle is for use with 24mm camera lenses. The regular wide angle is for 28mm camera lenses. Because these wide angle flash lenses disperse the light over a much greater area than normal, Guide Numbers and effective range are reduced accordingly. The opposite is true with the telephoto flash lenses. The short tele lens is for shooting in the 70mm and up range. Guide Number is increased to 79 and automatic range to 56 feet. The long tele lens is for 135mm and longer lenses. GN becomes 87 and the auto range extends to 62 feet. Or, if you're shooting at f/2 with ASA 100 film, in manual operation you could reach to 85 feet.

(Combine lenses with filters for special effects. The adapter unit accepts both inserts together.)

## 7 Filtered Flash

A special six-filter kit (for use with the adapter) includes a 4X neutral density filter for extreme close up flash exposures in automatic operation. A UV filter to eliminate Ektachrome "blues." A Type B conversion filter to give proper color balance when using Type B film with electronic flash. And red, blue, and yellow filters for special effects.



## 8 Quick Release Flash Bracket

This bracket gives you a solid, controlled platform for flash shooting. The quick release lets you remove the pistol grip/flash unit for off camera flash and aim it anywhere you want for bounce or direct lighting. The flash shoe rotates 360° for complete control of direction and angle. Choice of 35mm or 6 x 6 camera bracket. A cable release for the

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## TECHNIQUES TOMORROW

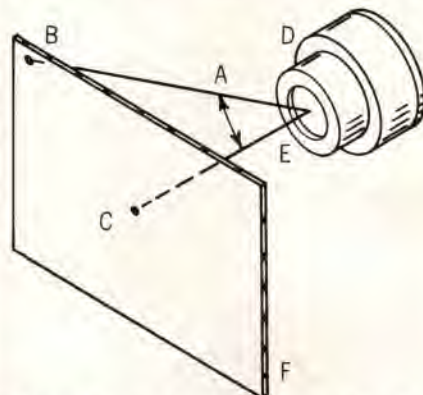
Continued from page 60

full stop would mean that the loss is .50.) But wait, we're not through yet.

The light coming to the corner of the film plane hits the film at an angle—the same as the off-axis angle we mentioned before. This results in an *effective* illumination loss, again equal to the cosine of the off-axis angle. We multiply this factor by our previous losses and we get the total loss. The total loss of effective illumination at the corner is, therefore, dependent on the cosine to the *fourth* power, or multiplied by itself three times. For our 30° off-axis angle, the light falloff drops to .563—about a full stop.

A simple lens with a 28mm focal length works at an off-axis angle of 37.1° to the corner of the 35mm film format. The cosine-fourth value for this angle is .404. This means that the exposure in the corner is only 40 percent of the exposure in the center of the format. This is a loss of more than a full stop! For many ordinary photographs, our attention is drawn to the center of the format and we often do not notice the darkened edges and corners of the print or transparency. But when pictures are taken of a large uniformly bright subject, say the sky, this loss is clearly seen.

However, this loss is not a problem we can never overcome. There are ways to de-



**Cosine power:** Basic off-axis angle (A) is formed by light rays traveling from center of exit pupil (E) of lens (D) to center (C) and corner (B) of film (F).

sign wide-angle lenses so that the cosine-fourth law can be beaten—by a little bit, anyway. The first one to notice the possibilities of getting around the cosine-fourth loss was Prof. Russinow, an optical scientist who did some lens designing at Carl Zeiss Co. in Jena, Germany during the 1920's. He found that, if the design included strong negative-power elements far away from the diaphragm, this caused the entrance pupil to have some aberrations. That is, the entrance pupil did not stay the same size for off-axis angles. In fact, with negative elements far in front of the diaphragm, the entrance pupil actually *grew* in size for off-axis angles. Prof. Russinow recognized that more light could then be transmitted by the lens to the corners of the image. This led to the conclusion that the design would result in better illumination at the corners of the film plane than the cosine-fourth law predicted. Russinow's designs were tried in the Leica and Contax in place of the earlier

Continued on page 151

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You can also develop your own Kodacolor II, Vericolor II, and similar type color negatives with our new Beseler CN2 Color Negative Developer. It's the first developer of its kind that gives you your choice of two convenient processing temperatures: 75° and 85° F. CN2 uses a three step process to give you color negatives with excellent fidelity and maximum sharpness for good enlargeability.

Why not pick up some of our "easy as duck soup" chemistry at your Beseler dealer today. Or write to us for more information.



**Color by Beseler...#1 in the dark.**



Beseler Photo Marketing Co., Inc., 8 Fernwood Road, Florham Park, N.J. 07932 Dept. CbB-MP







# The Contax RTS. With Carl Zeiss lenses, Yashica electronics, and Porsche design.

When Carl Zeiss, Yashica, and the Porsche Design Group announced coordinated research on a new 35mm SLR system, the world took notice. And made Contax RTS the most eagerly awaited camera of our time.

Today, the Contax RTS is a reality.

You can examine this extraordinary photographic instrument at selected dealers nationwide.

And when you do, here's what you'll find.

## Carl Zeiss lenses

Perhaps the finest optical system in the entire field of 35mm photography: Carl Zeiss T-Star (T\*) coated lenses.

From f3.5 15mm Distagon to f5.6 1000mm Mirotar, each of these superb lenses is among the fastest in its class. Many have advanced floating element design. And all are T-Star coated. A coating which not only eliminates flare, but also insures ultra-flat light transmittance at all wavelengths. For unsurpassed color fidelity.

To house lenses like these, the Contax/Yashica bayonet mount was created. A fast, smooth, one-fifth-turn bayonet mount, with internal linkage. So you change lenses quicker, with less fumbling.

## Yashica electronics

Unique electronics. Electronics which make the Contax RTS faster. Quieter. And far more accurate.

Instead of an ordinary mechanical shutter release, the Contax RTS has an extraordinary electromagnetic shutter release. You don't push it. You touch it,



with a stroke of no more than 1mm. It responds so fast, you get shots any other camera might have missed.

The Contax RTS has another electronic advantage. In its viewfinder, you see a display of 16 Light Emitting Diodes. They flash to tell you the shutter speed you're shooting at. Or light up when you press the exposure preview button. In low light, they're far easier to read than any other kind of indicator.

Exposure control of the Contax RTS is automatic. Or, you can control the exposure manually. The shutter you're controlling is air-damped, so it's very, very quiet. And practically vibra-

tion-free. With an infinite range of speeds, from 4 seconds all the way up to 1/2000 of a second.

In both automatic and manual exposure control modes, the Contax RTS shutter works electronically. And in either mode, you get the advantage of center-weighted, full aperture light metering. Metering guided by ultra-sensitive Silicon Photodiode, which reacts several thousand times faster than the CdS sensor system used in most cameras.

## Porsche design

Distinguished design. Styled by the famed Porsche Design Group, of West Germany.

A sleek black body with the elegant feel of fine leather. A body tapered and rounded to fit the natural curve of your hands. With controls in the normal positions your fingers fall, so you can make adjustments without having to look away from the viewfinder.

There's also a full system of professional accessories for the Contax RTS. Not one, but two motor drives. A heavy-duty motor drive with control grip and drive speeds up to 5 frames per second. And the Real Time Winder, a unique lightweight motor drive you add to the Contax RTS without special tools or modification. Without even removing the camera baseplate.

System. Electronics. Design. Together, they make the Contax RTS what it is. The world's first Real Time camera. A camera that's faster, more accurate, more exciting to use. A camera that can express your creativity like no other camera in history.

# CONTAX RTS

## Real Time Photography

For further information, and for the names of Contax RTS dealers in your area, write Yashica, Inc. 50-17 Queens Blvd. Woodside, N. Y. 11377.

©1976 Yashica, Inc.



# WHAT'S WHAT WHAT'S WHAT

## Kodeword Tapes Keep You From Self-Destructing

Hearing a strange voice in the darkroom may sound like your idea of a nightmare, but there's nothing to fear if the voice comes from a Kodak Kodeword cassette tape, a new idea in hands-on assistance from the folks in Rochester.

Six tapes have been introduced, covering the processing of black-and-white and color film and prints (TC-1), Ektachrome slides using process E-4 (TC-2), color printing in tubes for slides or negatives (TC-3), color negatives using process C-41 (TC-4), color prints in Kodak rapid processors (TC-5), and color prints in trays (TC-6). The list price of each is "less than \$6.90," and a \$1 refund is being offered until June 30 for those who return the registration card plus a coupon (or facsimile thereof) from a Kodeword ad.



"You have 60 sec., Mr. Phelps, to pour out the fixer, or this tape..."

out and wash. As accompaniment, you'll hear water running, reels clanking, buzzers buzzing and, when there's nothing to do but twiddle your thumbs, Muzak-type music.

Each tape has two sides, 30 min. to a side, and comes with an instruction sheet that you're to read before starting the tape. Beginners should benefit by having an "instructor" beside them in the dark; more experienced workers will be kept from falling asleep and missing a step. You do, of course, have to provide your own recorder.

We tried several of the tapes in practice and found them

accurate and occasionally entertaining. One odd note, though, for Tri-X fans: the Kodeword Tri-X tape puts you through development in 8 min. at 75° F, while Kodak's usual recommendation is 10 min. at 68° F (D-76 1:1). The tape's time and temperature may have been necessary to get all the steps finished by the end of the reel, but we'd expect negatives that are a trifle dense.

The six tapes now available cover the following: processing b&w film and prints (TC-1), Ektachrome slides using process E-4 (TC-2), color printing in tubes for slides or negatives (TC-3), color negatives using process C-41 (TC-4), color prints in Kodak rapid processors (TC-5), and color prints in trays (TC-6). The list price of each is "less than \$6.90," and a \$1 refund is being offered until June 30 for those who return the registration card plus a coupon (or facsimile thereof) from a Kodeword ad.

## Toshiba's Back With A Flash

One of the better-known names in the electronic world is making another foray into our photographic world. Several years ago, Toshiba, the Tokyo-based maker of television and other audio products, developed a line of small electronic flash units. That was in the early days of automatic flash and, like many of their competitors, there was a bit of "me-tooism" in their products. Now Toshiba has resurfaced with a new, more up-to-date, flash line consisting of three models.

The new trio uses the brand name Toshiba, is distributed here by Elmo Mfg. Corp., and spans the whole gamut of flash possibilities. Each model, happily, uses disposable AA batteries for power. Starting at the bottom we have the pocket-sized, two-battery manual model 201 (\$12.95). Measuring less than 3 in. in its longest dimension, it has a guide num-

New kids on the block: Toshiba's gavel-shaped ES-10S comes with auto sensor and bracket; auto ES-3 and manual 201 round out line.



ber of 28 for ASA 25 film, and gets about 120 flashes from alkaline cells.

Moving right along to the automatic goodies, we come to the small-to-medium ES-3 (\$59.95), running on four batteries which produce 300 flashes with 7-sec. recycling in the manual mode. The auto aperture for ASA 25 is f/2.8 for 2-12 ft., with a manual guide number of 36. Best of all, it has an energy-saving circuit which ups the possibilities to 4,000 flashes with .8-sec. recycling.

As you might have guessed, we've saved the best for last. The Toshiba ES-10S (\$139.95) is shaped like our old friend, the potato masher, and it does just about everything you'd want. The four AA's fit into the handle, and energy saving boosts the normal manual 130 flashes at 9-sec. recycling to a possible 3,000 with .5-sec. recycling. A big, easy-to-read, neatly click-stopped dial on top furnishes the data for the three auto f/stops. For ASA 25 they are: f/2 for 2-28 ft.; f/2.8 for 2-20 ft.; and f/4 for 2-14. Now don't go away. The 10S's bracket has four click-stopped positions for bounce. Naturally, there's a remote sensor to go with this feature to permit auto bounce shooting. Finally, there's a diffusing screen that provides the unit with wide-angle coverage. It snaps right in over the flashtube, the guide

number drops to 40, and the auto ranges extend to 20, 14 and 10 ft., respectively. The price, by the way, includes the whole package of accessories—remote sensor, wide-angle screen, etc.

## Rocky Rolles Along With The Emperor

Welcome Vice-President Nelson Rockefeller to the ranks of politician/photographers, who seem to be exclusively GOP—Howard Baker and Barry Goldwater in the Senate, for example, and if not President



Watch the birdie, says the V.P.



# WHAT'S WHAT WHAT'S WHAT V

Ford, then at least his daughter Susan. (The last president we can recall with a camera was Eisenhower, a Republican and Stereo Realist aficionado.)

Rocky's brand of shutter diplomacy seems to be less than perfect, though: when he had his own photo taken with his Rollei 35 (above), he was focusing on Japan's Emperor Hirohito during the latter's fall U.S. visit. Now, we know that some Rollei's come from Germany, and some from Singapore, but none come from the great camera-manufacturing land of Japan. If the Emperor noticed the diplomatic incongruity, he didn't mention it.

## Closeout Sale

Have we got a deal for you, said the note we received in the mail from the Ansel Adams Gallery of Yosemite National Park, Calif. Adams won't be printing to order after Jan. 1, the missive went on, but if you act quickly and enclose full payment, your choice of photos is available at \$800 per. Not only that: Adams will inscribe the back of the print (in archival pencil, we trust) with a personal message at no extra cost.

Behind the marketing message contained therein lay this noteworthy fact: after nearly 50 years of selling his prints to the public, Adams is calling it quits and instead intends to work on books, exhibits and—you can't keep a good printer out of the dark—special sets of photographs produced solely for museums and universities.

## Testing, Testing Un, Deux, Trois

When the editor of the French photographic magazine *Phot Argus* visited MODERN's lab, he immediately tangled with Hiroshi Kimata, our technical director. Standing toe to toe with Kimata in the midst of our sophisticated equipment, Gérard Bouhot fiercely debated

his personal approach to camera testing vs. our more scientific method. Bouhot's eyes gleamed and he became vehement on the subject of what he likes and doesn't about certain camera brands. Sometimes we agreed and sometimes we didn't, but we were impressed with Bouhot's thoroughness and dedication.

That thoroughness and dedication are the hallmark of the many-paged, all-encompassing test reports that Bouhot writes for his magazine. He covers the camera body, the lens line and a whole raft of accessories.

We think you'll find his exhaustive reports on cameras published in *Phot Argus* as fascinating and useful as we did. What, you do not *parlez français*? *C'est dommage!* We've had three great Bouhot reports translated—on the Minolta SRT, Olympus OM-1 and Konica Autoreflex T3—which can be your very own for \$2.95 apiece. Well worth it, we think (or we wouldn't have gone to the trouble of importing 'em). If you want one or all three, turn to page 142 and find out how to order.

## Now See Her, Now SEE Her! Now See America

The beginning of the bicentennial bash was upon us and we needed someone to help us celebrate. We had planned a big series on taking pictures at some of the country's better-

known tourist attractions, and our need was for someone who could put it all together—a photographer/editor/writer; someone who knew photo equipment technically, knew something about travel and traveling, and would ask the right questions when he/she got to each tourist mecca. In other words, a Lyle Lawson.

There aren't many LL's around, but we found one. Right now she's a free-lance photographer, doing a lot of work for *Family Circle*. Lyle has also handled staff editorial assignments for that magazine's various sections. Before that she was a technical and sales representative for Honeywell Photo, a model, and an airline stewardess.

That would seem to take care of her qualifications. Now, what does she look like? Does she have two heads, four hands, or what? "No, I don't have two heads," she said, "just two versions of same. Which one do you want? Before *Family Circle* completely changed my image, or after?" We wanted to see both, and, after seeing them, thought you might like to see them too, side by side.

The "after" shot is the result of a "make-over" session conducted by FC and detailed in their Feb. 1976 issue, showing you what a new hairstyle, new makeup, etc. can do to your appearance. How about it, folks? Is it worth the effort? You be the judge. And if you want to judge Lyle's first effort at recording America's beauty spots, turn to page 86.



Two faces of Lyle Lawson, our Bicentennial feature writer and photographer, before and after *Family Circle* make-over.

## At The Galleries

### CALIFORNIA

Focus, San Francisco  
Greg McGregor, Steve Collins, Victor Landweber/Jan. 6-31  
Jim Lucas, San Francisco  
Yoshiro Soga, Bill Gordon/Jan. 1-30  
Skinny Art, Los Angeles  
Robert Forrester/Feb.

### IOWA

East Street, Grinnell  
Ron Geibert/Jan. 3-30  
Rick Valicenti/Feb. 1-28

### MARYLAND

Univ. of Md., Baltimore  
"Extended Realism"/Jan. 31-March 14

### MASSACHUSETTS

Berkshire Museum, Pittsfield  
Jonathan Weiss/Jan.  
John Shay/Feb.  
Prospect St. Co-op, Cambridge  
Viny Guadido/Jan.  
Paul Light/Feb.  
Worcester Art Museum  
Eliot Porter/Dec. 16-Feb. 22

### MISSOURI

Columbia, Columbia  
Morley Baer/Jan. 15-Feb. 6  
13 x 15, St. Louis  
"Many Views"/Jan. 26-Feb. 27

### NEW MEXICO

Univ. of N.M., Albuquerque  
Lewis Baltz/Dec. 21-Feb. 15

### NEW YORK

Fourth Street, New York  
Elijah Cobb/Feb. 1-14  
Light, New York  
John McWilliams, Neal Slavin/Jan. 13-Feb. 7  
Parents', New York  
E. Trina Lipton/Jan.  
Soho Photo, New York  
Dennis Rizzuto, others/Jan.  
Witkin, New York  
Les Krims/Jan. 13-Feb. 14

### PENNSYLVANIA

Photography Place, Berwin  
Joan Lifin/Jan. 7-Feb. 6  
Photopia, Philadelphia  
"Mummers"/Dec. 30-Jan. 20

### TENNESSEE

Middle Tenn. State Univ., Murfreesboro  
Diana Hulick/Jan. 18-Feb. 5

### TEXAS

Cronin, Houston  
Chester Michalik/Jan. 6-Feb. 14

### WISCONSIN

Infinite Eye, Milwaukee  
Philip Krejcarek/Jan. 13-Feb. 1



# WHAT'S WHAT WHAT'S WHAT



Dirty old Daguerreotype above is the same as pristine plate below. Southworth and Hawes, meet George Eastman House!

## Pssst . . . Want To Clean Some Feelly Pictures?

We told you about the folks deep in the basement of George Eastman House in Rochester who are up against the footings fighting the vanishing image ("What's What," Oct. 1975, p. 56); well, already they're doing a better job of restoring somewhat vanished images than we would have thought possible.

The official name of the fledgling subterranean organization is the Photographic Conservation Center, and it's responsible for the remarkable

transformation of the desecrated Daguerreotype above (top) into the near-perfect plate below it. De-besmirching Daguerreotypes isn't as easy as you might suppose, since each negative-less image is unique as well as fragile, adhering rather tenuously to a copper plate.

In case you're wondering what the picture is, it's a full-plate ( $6\frac{1}{2} \times 8\frac{1}{2}$ -in.) "class portrait" of 23 young women from the Emerson School in Boston, taken about 1850 by the famed photographic team of Southworth and Hawes. The image, owned by New York's Metropolitan Museum of Art, is described as "rare, valuable and unique" in that it avoids the

conventional painted backdrops, stiff poses and artificial compositions typical of the era. While we're not sure the restored result is "surreal and mysterious" as claimed, we're quite sure it's now the cleanest Daguerreotype in town.

## He's Adapted To Adapters

We're always delighted when some useful but regrettably discontinued piece of photographic equipment receives a new lease on life. In this case, an enterprising photographer has done us a favor.

Some years ago, Smith-Victor, which makes all kinds of lighting equipment, brought out an adapter that screwed into any socket designed to take a No. 2 photo-flood, thereby permitting you to plug in a variety of miniature two-pin quartz halogen lamps. After a few years, the folks at S-V had problems in production—one of their dies broke—and they discontinued the item. Knowledgeable professionals soon brought up any that were around and found they were worth their weight in . . . well, quartz halogen lamps, anyway.

Last year Keith Essex of Golden, Colo., became annoyed that these adapters were no longer available and tried to find out why. The Smith-Victor people were honest with him, explained their problems, and even sent him some parts so he could see what made the adapter tick. Essex devised a way to manufacture them himself, bought out S-V's miscellaneous parts and is now doing a thriving business in adapters. About  $3\frac{3}{4}$  in. long, they screw into the socket of any photo-flood reflector and can accept such quartz halogen lamps as the 3400 K DVY (650 Watts, 25-hr. life), the 3200 K DYH (600 W, 75 hr.) and the 3200 K DYM (420 W, 75 hr.).

They also place the filament at the spot in the reflector where a No. 2 flood would be, so you

## 35 Years Ago In MODERN . . . Feb. 1941



• "How to Add Trick Silhouettes to Your Pictures" by Henry Clay Gipson explained that the cover shot was made from a combination of two negatives. The "trick," in this case, was double-printing a slide of the photographer's shadow on a white background with the original.

• William Mortensen, a leading studio photographer of the day, gave readers "Four Rules for Better Lighting": 1) Avoid completely black areas; 2) Avoid blank white areas; 3) Concentrate the light on the area of greatest interest; and 4) No matter how many lights are used, one must dominate.

• With \$20 worth of materials, and tools "purchased at the ten-cent store," readers could follow author/illustrator Ramon Elfenbein's plans and "Build a Precision-Type Enlarger." The final result resembled an erector-set marriage of Omega and Durst.

get the same beam pattern. But, of course, the QH lamps have a much longer life with only a little falloff of light or color temperature as they age.

Essex calls his units Photo-Lite adapters and sells them for \$9.50. Essex's business address is: 13372 West 24th Pl., Golden, Colo. 80401.



# WHAT'S WHAT WHAT'S WHAT

## Books In Brief

**These United States**, photographs by Fred J. Maroon, text by Hugh Sidey. EPM Publications, McLean, Va., 256 pages. 8 3/4 x 12 in. Hard cover.

Every gimmickless photo "trick" in the bag is used in this handsome, well-printed book. In fact, if you could change this essay on America to a nuts-and-bolts explanation of how to add visual punch to straight scenic shooting, you'd have a highly-instructive, simple photo course for amateurs.

Unfortunately, that's just wishful thinking. But Maroon, a pro with 20 years of experience, combines his knowledge of equipment and films with a thoughtful approach to each subject that you can pretty much see for yourself. Bird's-and-worm's-eye views, compression shots resulting from long tele lenses, out-of-focus foregrounds, etc., are as old hat as Paul Revere's three-cornered *chapeau*, but when these "tricks" are applied to the appropriate subjects, the results are graphic, decorative and pleasing. Berkey K+L (222 East 44th St., New York, N.Y. 10017) is offering each of the 125 color images in this volume as either individual dye transfers or Ektacolor prints ranging in size from 11 x 14 in. to 40 x 60 in. Recommended.—J.G.

**Early War Photographs**, 50 years of war photographs from the 19th century, by Pat Hodgson. New York Graphic Society, Greenwich, Conn., 159 pages. Hard cover, \$12.

After the second Sikh War of 1848 came the second Burma War of '52 (which implies that there was a first Burma War, but we won't go into that). Then there was the Crimean War, the Indian mutiny, the Chinese wars, the American Civil War and war with Japan. The Germans fought the Danes, the British tangled with the Abyssinians and the French battled the Prussians. Enough. If you don't believe it, ask Felice

Beato; he photographed it all, or at least a good part of it. This easy-reading survey has 97 sepia-toned photos and surprisingly well-detailed captions.—J.G.

**Love, Sunrise and Elevated Apes**, by Nina Leen. W. W. Norton & Company, Inc., 500 Fifth Ave., New York, N.Y. 10036, 128 pages. 8 x 8 in. Cloth, \$5.95; paper, \$2.50.

Former *Life* photographer Nina Leen has taken some of her old black-and-white shots, paired them with quotes from sages, poets, etc. and strung them together as "pearls" of wit and wisdom. The results are tired and dated-looking, and make you think that someone poisoned the oysters.—J.G.

## The Big Dipper Serves Up Super-Size Prints

The effect of print size on our perception of a photograph doesn't get too much attention, primarily because photographers have a limited choice of scale: 5 x 7 in., 8 x 10 in., 11 x 14 in. and 16 x 20 in. are the common choices. Beyond 16 x 20 one reaches a rarified world wherein difficulties, abound, the most basic being: "How the heck can I process a print that's all of 3 ft. long?"

The answer up to now has been, discounting the prospect of giving the job to a custom lab, to use either large trays (best combined with a large sink) or a large drum. Each has its drawbacks: for trays, large amounts of chemicals, a large amount of space and a large investment; for the drum, the paper size must be exact (this is important, since the large-size printing paper required only comes in rolls), and the processing occurs out of sight.

So now, along comes the Big Dipper, a \$119 print processor handling sizes up to 30 x 50 in. which promises to put super-scale photos within the reach of even casual amateurs. It not only promises; it delivers.

A fine example of low-budget engineering, the Big Dipper is essentially a rectangular frame with a roller across the top and a fitted bottom that holds one of the four trough-shaped trays at a time. The troughs hold the processing solutions (a quart of each is all that's needed), and the top roller moves the print paper up and down through the trough via two sets of strings and metal attachment bars. A lower roller sits in the trough and the paper gets wet by rolling around it.

Intent on making a giant print, we started by ordering a 30-ft. roll of 40-in.-wide Kodak RC paper through a major big-city photo supply house (we queried suppliers in both New York and Chicago and found no scarcity of the stuff). It's important that the paper be resin-coated; otherwise, your arm may fall off as you roll the paper through a 1-hr. wash. Next, we aimed our enlarger at the floor, focused, and got the image size we wanted. The appropriate length of paper was then

cut from the roll, taped to the two metal edge plates, exposed, and hung on the Dipper's twin stainless-steel brackets.

Processing itself was easy and followed the normal timing for RC paper once the Dipper was adjusted properly for the paper length in use and the fluid level in the troughs. This took a bit of practice, but by our third print we weren't experiencing any problems.

We found one thing which may be helpful to potential dippers: rather than use the crank attached to the top roller to whisk the paper along, we saved ourselves a bad case of cramps by employing the handle shapes built into the wire mounting brackets. This method is more speedy, too, which helps prevent any development streaks. Our overall impression: it's hard to beat, considering the price and the small amount of space the operation requires. If you think big might be better, write The Big Dipper, 67 Center St., Clinton, N.J. 08809.

Roll your own with the Big Dipper, and you won't need a darkroom as big as a garage to make super-sized mural prints.





# CONSUMER GUIDE®

## The Best of Photographic Equipment



Whether you are a professional photographer or an amateur cameraman specializing in shooting your children's birthday parties, **Consumer Guide Magazine's The Best of Photographic Equipment** is the book you will have to read. It is written for the photographic equipment buyer who is suffering the most from skyrocketing costs and the confusing, conflicting information on the multitude of models currently in the marketplace.

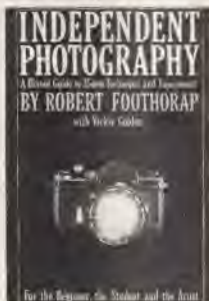
Featuring practical guidelines for every type of photographic equipment—from how to buy to what to buy and what to pay—**The Best of Photographic Equipment** is a veritable gold mine of facts and figures that will lead you through the bewildering maze of still cameras, movie equipment, film, dark-room equipment, filters, and electronic flash guns. In addition, **Consumer Guide** photography experts rate, without regard to price, brand, or prestige, the latest photographic equipment on the basis of features and performance. **751114/\$4.95 paper**

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This unique, action-oriented guide to 35mm photography demystifies the art of picture-taking while explaining how to keep expenses down. Whether you're approaching photography as a hobby or considering it as a serious career, this book will provide you with essential practical knowledge, including:



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- How to buy the best camera system at the most reasonable price
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- The basic steps involved in developing and printing black-and-white photos in a home darkroom
- Tips on camera technique, legal rights, and selling photographs.

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# quick notes

New items worth a look.

**What every magician needs:** Pfefer's "Bag of Tricks" extends creativity of you and your SLR with series of frame modifiers. Holder fits over lens, and any one of a half dozen mask-type screens fits in holder to produce such effects as vignetting, as well as effect of looking through oval, heart-shaped, etc., openings. Available from Pfefer Products, neatly packaged in miniature gadget bag, for \$39.95.

**Edwalian edifiers:** Four Plus One Super Hypo Eliminator speeds up removal of silver thiosulfate complexes in wash cycle, prevents oxidizing effect of air and chlorine, and coats silver image with protective compound. Edwal Fototints, a set of 12 dyes, are useful as slide titlers as well as print and film retouchers. Can be used to add color to b&w prints too. Available from your dealer.

**Fix it yourself:** Why not do little lens-barrel-type tightening-up jobs yourself, provided your lens has the standard, single-slot head screws. Braun's Screw Driver Kit takes up as much room (4 1/8 in.) as a ballpoint pen, without the pocket clip. Top pulls off, revealing compartment that holds three extra screwdriver blades ranging from minuscule 1mm blade to "big" 2.3mm one. Knurled aluminum for easy gripping. At your dealer for \$4.25.

**Impinging on the air:** Technal's A-1 air impingement drier is made for new resin and plastic-coated color and monochrome prints. Dries eight 8 x 10's or four 11 x 14's



in as few as 8 min. Contains four removable 11 x 17-in. plastic-coated steel print racks, adjustable heat control. Operates with 650-watt, 120-volt power consumption. From Bogen Photo Corp. for \$119.95.

**Longie for Leica:** Originally designed for U.S. Navy, Leitz's new 180mm f/3.4 APO Telyt-R is now available for everyman's Leicaflex. Said to combine very high resolving power with almost complete elimination of chromatic aberration. Measures a very compact 5.31 in. (that's just about 135mm) long. Apertures at half-click-stopped intervals to f/22; focuses down to 8.2 ft.; has auto diaphragm; couples to Leicaflex metering system. Built-in sliding lens shade. At your dealer, \$798.

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| 126    | 12                 | 3 1/2 x 3 1/2 | \$2.15                | \$3.40                      |
|                                                                                           | 20                 | 3 1/2 x 3 1/2 | 3.25                  | 5.00                        |
| 110    | 12                 | 3 1/2 x 4 1/2 | 2.15                  | 3.40                        |
|                                                                                           | 20                 | 3 1/2 x 4 1/2 | 3.25                  | 5.00                        |
| 127, 120, 620                                                                             | 12                 | 3 1/2 x 3 1/2 | 2.55                  | 3.85                        |
| 135mm  | 20                 | 3 1/2 x 5     | 3.85                  | 5.55                        |
|                                                                                           | 36                 | 3 1/2 x 5     | 7.15                  | 9.35                        |
|                                                                                           | (1/2 frame) 40     | 3 1/2 x 5     | 10.90                 | 12.65                       |
|                                                                                           | (1/2 frame) 72     | 3 1/2 x 5     | 17.30                 | 19.55                       |

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| 135MM 20 EXPOSURE                   | 1 to 3 each | 4 or more |
|-------------------------------------|-------------|-----------|
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| Ektachrome X.....                   | 3.15        | 3.05      |
| Hi-Speed Ektachrome.....            | 3.50        | 3.40      |
| For 1/2 Frame, add \$1.60 per roll. |             |           |
| 135MM 36 EXPOSURE                   |             |           |
| Kodachrome 25 or 64.....            | 4.55        | 4.45      |
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| Hi-Speed Ektachrome.....            | 5.25        | 5.15      |
| For 1/2 Frame, add \$2.50 per roll. |             |           |
| 120, 620 OR 127 EKTACHROME X.....   | 3.45        | 3.35      |
| 126 FOR INSTAMATIC® CAMERAS         |             |           |
| Kodachrome 64 — 20 exp.....         | 3.10        | 3.00      |
| Ektachrome X — 20 exp.....          | 3.20        | 3.10      |
| Hi-Speed Ektachrome — 20 Exp.....   | 3.50        | 3.40      |
| 110 FOR POCKET INSTAMATIC® CAMERAS  |             |           |
| Kodachrome 64 — 20 exp.....         | 3.10        | 3.00      |
| Ektachrome X — 20 exp.....          | 3.20        | 3.10      |
| MOVIE FILM (WITH PROCESSING)        |             |           |
| Kodachrome 40 — Super 8.....        | 3.90        | 3.80      |
| Kodachrome 25 — 8mm Roll.....       | 3.75        | 3.65      |
| Ektachrome 40 — Super 8.....        | 4.15        | 4.05      |
| Ektachrome 160 — Super 8.....       | 4.60        | 4.50      |

**COLOR PRINT FILM**  
(with developing and printing)

| KODACOLOR II                                 | 1 to 3 each | 4 or more |
|----------------------------------------------|-------------|-----------|
| 126 — 12 exp..... 3 1/2 x 3 1/2.....         | \$3.40      | \$3.30    |
| 126 — 20 exp..... 3 1/2 x 3 1/2.....         | 5.00        | 4.90      |
| 110 — 12 exp..... 3 1/2 x 4 1/2.....         | 3.40        | 3.30      |
| 110 — 20 exp..... 3 1/2 x 4 1/2.....         | 5.00        | 4.90      |
| 135mm — 20 exp..... 3 1/2 x 5.....           | 5.55        | 5.45      |
| 135mm — 36 exp..... 3 1/2 x 5.....           | 9.35        | 9.25      |
| 120, 620, 127 — 12 exp... 3 1/2 x 3 1/2..... | 3.85        | 3.75      |

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# too hot to handle

I am interested in the Minolta XE-7 camera, and I read your test of same in the June 1975 issue ("Modern Tests," page 98). I (and, I'm sure, plenty of others) think that the "heart" of any camera is the lens—specifically, lens sharpness. I was, therefore, not impressed with your results of the f/1.4 Rokkor-X. Can you furnish any resolution data on the normal f/1.7 Rokkor-X? I won't buy the Minolta with the f/1.4, but if the f/1.7 rates a few more "excellents" I'll buy it with the f/1.7, trading the extra f/stop for sharpness. I know you claim that slight differences are not apparent until big blow-ups of the negatives are made, but *this is not so*. A good hand-held viewer will show the difference immediately.—Joseph Gerbino, Great Neck, N.Y.

As our November 1973 test ("Modern Tests," page 131) of the 50mm f/1.7 Rokkor-X shows, its performance doesn't differ markedly from that of the 50mm f/1.4 Rokkor-X whose performance you found so dreadful. However, we emphatically disagree that either lens is bad or even mediocre—both, in fact, are above-average performers in their speed and focal-length ranges, and furthermore, we believe that this is precisely what our test charts indicate. If you and other readers who've sent us similar diatribes persist in thinking that any verbal rating of less than "excellent" constitutes damnation with faint praise, then you will continue to derive erroneous information from our lens test charts. Incidentally, we do not spend many tedious hours conducting optical bench and field tests and then publish the results of our optical analyses simply for our health. It might, therefore, behoove you to consult this vital information when formulating your choices, since it is often as important, if not more important, than lines-per-millimeter ratings. Finally, in response to your assertion that you can discern "slight differences in sharpness" (presumably, say, the difference between "very good" and "excellent" resolution) by examining a negative or slide in "a good hand-held viewer," our one-word comment is "balderdash."

I read with interest your test report on the new Rollei 35S camera ("Modern Tests," Sept. 1975, page 110). However, there is no mention of a switch to turn the meter off and on, so I assume that the meter is in operation any time the camera is out of its case. I wonder, what experience has your staff had with battery life? Secondly, since it is necessary to cock the shutter to collapse the lens, do you feel that this will cause undue strain on the shutter?—Jerry Cullen, Jackson, Tenn.

You are correct in noting that the Rollei 35S has no switch to turn the meter off; but

if you replace the battery once a year as recommended you shouldn't run into any problems. The shutter is also designed to be reliable even though it is stored in the cocked position. The previous model Rollei 35, which we tested in 1967, operated in precisely the same manner and over the years has proven quite dependable.

I am thinking about purchasing a really fine camera so that I can improve my picture taking. I've been looking in the \$300-350 range (body only) and tend to favor the Canon F-1 at this price. A new Nikon seems to run a bit more, and I have been told that the Canon is probably a better buy, dollar for dollar. To complicate matters, my local dealer just showed me a Nikon F that is available which I can buy for \$300 (body only). Which, in your view, is the better buy?—M. Jason, New York, N.Y.

If we were attempting to choose between the Nikon F-2 and the Canon F-1, it would indeed be a difficult decision, as these are both absolutely top-quality machines and the advantages of each system are perennially debated by devotees of each. However, since you are considering the Nikon F (which has been discontinued and superseded by the F2) as opposed to the Canon F-1 (which is the current top-of-the-line Canon), we would opt for the latter. Although current Nikon lenses will fit the Nikon F, many of the latest accessories designed for the present Nikon F2 do not. In addition, \$300 for a Nikon F (body only) is not an especially good buy, whereas \$300 for a Canon F-1 (body only) certainly is.

I'm still happy with my 6 or 7-year-old Topcon Auto 100 and its 35 and 135mm lenses. But I now want another good 35mm camera and am considering the Topcon IC-1 since its optics are compatible with my present camera. However, I've never seen the IC-1 tested in MODERN and wonder what's your opinion of it.—Jack Fisch, Wilmette, Ill.

In view of the fact that importation of the Topcon IC-1 has recently been discontinued, you might want to reconsider getting involved with it, even though it is a competent camera and compatible with some of your present Auto 100 lenses. We therefore suggest you keep your faithful Topcon but consider supplementing it with another of the many good interchangeable-lens SLR's now on the market.

I have noticed in both MODERN and many other publications that the majority of photographs published are accompanied by pertinent data such as exposure, aperture and lens used. It would appear to me that if a photographer was shooting even a 20-

exposure roll of film, all those exposure figures would be rather hard to remember. So, my question is: How do they do it, if indeed they do?—E. Williams, Frederick, Md.

Aside from the obvious fact that photographers can recall what lenses and exposures they used for a given setting and lighting because they know what they usually use in a given photographic situation, there is another factor: professionals (and others who want to be sure of getting the desired shots) often use lots of film. Therefore, it is certainly not uncommon to shoot an entire roll of film with the same lens and even the same shutter speed and aperture, and label it accordingly. Also, some sticklers (especially large-format buffs) do record the exposure data for each shot.

To the owner of a Canon EF, is there any advantage in purchasing a Canon 133D Speedlite (CAT system) as opposed to any good autoflash unit which doesn't require a coupling pin on the lens? It seems to me that the CAT system pretty well limits one to certain Canon lenses for flash photography. True or not true?—Ralph Fontana, Guerneville, Calif.

True, but Canon's CAT autoflash system also has advantages. Since it's the physical location of the coupling pin protruding from the focusing mount of the Canon lens which determines the flash exposure by actually "reading" the flash-to-subject distance (rather than reading the light bouncing off the subject as with other autoflash systems), you won't underexpose a dark subject against a light background (or vice versa) when using a CAT-system flash, and you will automatically get the smallest lens aperture possible. On the other hand, many non-CAT automatic flash units work quite well under most conditions (though at relatively wide fixed lens apertures) and, as you note, they're more flexible since they'll operate automatically with any independently produced lenses you may later acquire. Furthermore, unlike CAT units, they don't require that you fit a bulky unit to the front of your lens.

I would like to purchase a good-quality 35mm single-lens reflex camera for around \$150. The camera does not have to conform to professional standards, but I would like one which is well-built and reliable. Can you recommend any?—Barry Frishberg, Smithtown, N.Y.

As a swift glance at MODERN's mail-order section will indicate, most manufacturers of top-grade 35mm SLR's do have a "second-line" model which retails in the region of \$150 with an f/1.7 to f/2 normal lens. Among the many recommendable ones that come to mind are the Canon FD, TX or TLb with 50mm f/1.8 Canon lens, the Fujica ST701 with 50mm f/1.8 Fujinon, the Minolta SR-T101 with 55mm f/1.7 Rokkor, the Pentax Spotmatic or SP 1000 with f/1.8 or f/2 Takumar, the Miranda Sensorex II with 50mm f/1.8 Miranda, and the Mamiya DSX 500 with 50mm f/1.8 Mamiya/Sekor. There are, of course, others, but all those mentioned are highly serviceable match-needle-metering cameras lacking a few deluxe features (such as aperture and/or shutter speeds visible in the finder or complete exposure automation) that are present in their more expensive "top-of-the-line" counterparts.



# How to Go Slow

Forget, if you will, everything you've heard or read about crystal-sharp pinpoint detail being the ultimate test of picture quality, and take a step into the world of blur, shake, pans, ghosts and other varieties of movement portrayed in still photographs.





We're talking about slow shutters—slow enough to let a subject move during the time the shutter is open.

There's no magic formula for determining what shutter speed will convey the effect of motion you see in your mind's eye when dealing with a given subject. One second may be too fast if you want to show the mo-

tion of the moon; 1/1000 sec. may be too slow if an Indianapolis racer is whizzing by 25 ft. away from you. Everything depends on the subject's speed, its distance from the camera, the direction of its motion and whether or not you're moving the camera. To succeed without relying on previous experience, you need to

*Continued on page 158*

**Panning to create movement** is part of Tomas Sennett's method for getting dramatic blurred shots like this (below) of a woman running to catch a train (actually the train was stationary; Sennett's pan gives it the appearance of motion). Sennett says that subject speed and direction, lighting and camera movement make each picture-taking situation unique. He used neutral-density filters on his lens to get a shutter speed between  $\frac{1}{2}$  and  $\frac{1}{15}$  sec. with Kodachrome II in a Nikon F.

**Four more pages of motion follow!**





## Slow Shutters (cont.)

**Neutral-density** filtration was the key to Bob Gelberg's notion of showing this blur of half-time action at a sunny, mid-afternoon football game (right). "Most shots I've seen like this were taken in subdued light," he says. A 1-sec. exposure on Kodachrome 25 required an aperture between f/11 and f/22. A four-stop ND filter on his 200mm f/4 Nikkor lens cut the light sufficiently to allow the long exposure needed. Gelberg followed the Nikon FTn's meter reading and had the camera atop a tripod to keep the field sharp.



**Sharp vs. blurred** contrast (opposite page, top) makes the statement Joel Sternfeld sought in this photograph of a confirmation party. The low light level inside the church basement didn't give him much choice of shutter speed, since he had Kodachrome 25 already loaded, but he slowed down his shutter more than necessary—1 sec. at f/16—and used a tripod to get what he wanted. To avoid color casts from the overhead fluorescents, he turned them off rather than trying filtration. The camera was a Pentax Spotmatic IIA; the lens, a 50mm f/1.8 SMC Takumar.

**Pinpoint-effect pan** of Times Square lights sets Magnum member Erich Hartmann's photograph (opposite page, bottom) above the visual cliché. During a panned exposure of between  $\frac{1}{4}$  and  $\frac{1}{2}$  sec., an auxiliary shutter of Hartmann's own making piled individual images atop one another. While modern SLR's with multiple-exposure provision can achieve the same effect, this picture serves to remind us that a long exposure can consist of several short ones on a single frame. Hartmann hand-held a Pentax Spotmatic with 85mm f/1.8 Takumar lens and shot without filtration after sunset, basing his exposure on the results of previous experimentation.





More motion  
on following pages





**Motion within motion** carries the graphic message of speed and struggle in this photo of a bicycle racer (above) by Melchior DiGiacomo. During an  $\frac{1}{6}$ -sec. exposure on Kodachrome II, DiGiacomo panned horizontally with his Nikon F2 and 80-200mm f/4.5 Nikkor zoom, creating long streaks of light while the racer's own motions made the streaks change direction (no zooming was used). "I generally try to underexpose one full stop with an exposure like this," says DiGiacomo, who used an incident meter to arrive at an aperture of f/32. "The results seem to come out looking normal."

## How slow is slow? What's freezing?

We decided to check how slow a shutter speed is needed to show blur in a common type of subject—a person running at an average speed, for instance (right). What we found is that even with a slow-moving human (15-25 mph), you can detect motion with all but the highest shutter speeds. But, let's qualify that statement immediately, for the blur effect depends on a number of variables: direction of the motion in respect to your camera, whether the camera is panned or a flash is used, etc.

In the middle photo at right the camera was panned; compare it with the photo above it (same exposure) and you'll get an idea of how motion can be portrayed several ways. The flash picture (middle row, right) shows the streaks called "ghosting" that can occur when the existing light level is high, and thus a secondary image is recorded. In the bottom row are three identical exposures showing the effect of the motion's direction on the image. Which portrays a sense of movement best? You're the judge.

## Slow water's flow? Flash does it!

Since water is a popular subject with slow-shutter enthusiasts, we set up a controlled situation to see three of its many faces. Not surprisingly, at slow speeds our results looked more like velvet than water. A  $\frac{1}{125}$ -sec. exposure slowed the spigot's pour somewhat, but it took a brief burst from an automatic flash unit at close range to stop everything in its tracks.





1/8 sec.: nothing but blur.



1/30 sec.: better but unsharp.



1/250 sec.: crisp except for pant leg.



1/1000 sec.: he's finally frozen.



1/30 sec. panned: better than above?



1/15 sec. with flash: "ghosting."



1/60 sec. perpendicular: very blurry.



1/60 sec. at 45° angle: blurry.



1/60 sec. straight on: looks sharp.

Mickey Ploger



1 sec.: as soft as a baby.



1/125: looks frozen, but . . .



1/50,000 (autoflash): like glass!



# Kodacolor-Onward & Upward,

**Color slides came first in the scheme of things, and then color negative films tried to catch up. Has there been any real progress?**

Shooting color slides and transparencies became quite popular in the U.S. following the 1935-36 introduction of Kodachrome and Agfacolor reversal materials. However, the widespread use of color negatives and prints had to wait until Kodacolor's debut in 1942.

But there is a world of difference between that 1942 Kodacolor—in both negative materials and prints—and what we have today. The many changes that have taken place in negative and print materials over this period of almost 35 years are striking examples of technological progress. And steadily improving quality while maintaining price stability is a rare accomplishment these days. How has it all come about? Let's start back at the beginning.

Kodachrome and Agfacolor initiated the rapid growth of practical color photography all right, but 35mm color slides did not offer the casual roll-film camera user any direct means of obtaining color prints on paper. What was needed was a negative-positive color system that, as

far as the user was concerned, was essentially the same as the black-and-white negative-positive system—in other words, a film which you exposed and then sent to a photofinisher, who then processed it and returned the negatives along with a set of corresponding prints. Furthermore, to be commercially successful, a color system had to be practical for ordinary amateur roll-film cameras, even simple "box cameras."

To satisfy these needs, a multilayer color negative was required. It would have to contain the usual cyan, magenta and yellow dyes (see film cross section below) to reproduce the original subject in its complementary colors; blues in the subject would be recorded as yellow negative images, reds as cyans, greens as magentas, etc. (see fruit bowl negative, below). When such a negative was printed onto a multilayer paper with a similar system of dye formation, the original subject colors (also below) would be reproduced reasonably well.

And so, in line with this thinking, Ko-

## The fruit was the same, but the film wasn't.



**1942 unmasked:** First Kodacolor available in roll film formed only three negative dye images over the film base. Its speed was a paltry equivalent of ASA 20.



**Poor results by today's standards:** Unmasked negative described at left had virtually clear base with complementary color images (above). Prints made on multilayer paper were barely adequate (print above). Blues and greens were too dark, while reds and yellows often reproduced too light.



**Significant color reproduction improvement:** Orange masked negative of 1948 at last produced color prints comparable with professional color printing processes. This same basic layer construction continued with Kodacolor-X in 1963 (negative and print above) and is used today in Kodacolor II (introduced in 1972).



**Grain reduced, sharpness increased:** 95X magnifications of neutral gray areas in original Kodacolor (left) X (center) and II (right) show improvements.



# But Better???

Text by Howard Colton  
Rochester Institute of Technology

dak introduced Kodacolor in 1942. The exposed roll film (there was no 35mm) was returned to Rochester for developing and printing. The daylight film speed of 20 (ASA equivalent) was barely adequate for box cameras. By today's standards the prints were rather poor; the color reproduction left much to be desired. When compared with the color quality obtainable with projected 35mm Kodachrome transparencies, for example, it was apparent that this negative-positive color print system faced an uphill battle. However, they *were* color prints on paper and they *had been obtained with the same method commonly used for black-and-white prints* made by photofinishers. Of course, these early prints surely were not competitive with color prints made by laborious dye transfer techniques then used by professional color photographers. In fact, they didn't seem to offer much hope of *ever* being comparable in color reproduction or stability—and yet today they are quite comparable. What major improvements

have made it possible to obtain inexpensive color prints that are difficult to distinguish from expensive professional-quality dye transfers of the same size?

Certainly, improvements in color reproduction have played a role. The first Kodacolor negatives essentially had complementary colors within their layers to reproduce subject colors as explained previously. But the print color reproduction was just barely adequate. The deficiencies were most apparent in the blues and greens, which were too dark, while reds and yellows were often too light. While improvements were obviously needed in these areas, the prints were acceptable to the public and indeed represented the "state of the art" in 1942.

The first improvement was not long in coming. In 1943 a new Kodacolor replaced the original film. This film was more complex in that it had a fourth image layer which was converted into a silver positive mask image during processing (diagram below). The new negative (shown below) appeared to be lower in

contrast and darker than the original Kodacolor negative. The addition of a masking layer made the new film more complex to manufacture and required a much more complicated processing procedure since the masking layer emulsion was not exposed until after color development had formed the three dye images. The positive silver mask image was then developed. Despite these complexities, a noticeable improvement in color reproduction was obtained in the prints. This was striking in the improved reproduction of blues and greens.

While color reproduction was now better, it was still not up to professional standards. A further improvement had to wait for a fundamental invention. This was the new concept of colored couplers, which were incorporated in a new Kodacolor negative film in 1948 (diagram, below right). Here for the first time was the familiar reddish-orange Kodacolor negative (negative of mother and children, below left). This overall

*Continued on page 122*



**1943 silver mask:** More complex film appeared with fourth image layer that converted into silver positive mask during more complicated processing.



**Better negs and better prints:** Silver masked negative appeared lower in contrast and allowed improved prints, particularly in the blues and greens.



**1948 orange negative:** Two residual colored couplers (one reddish, one yellow), incorporated in emulsions during manufacture, acted as printing masks.



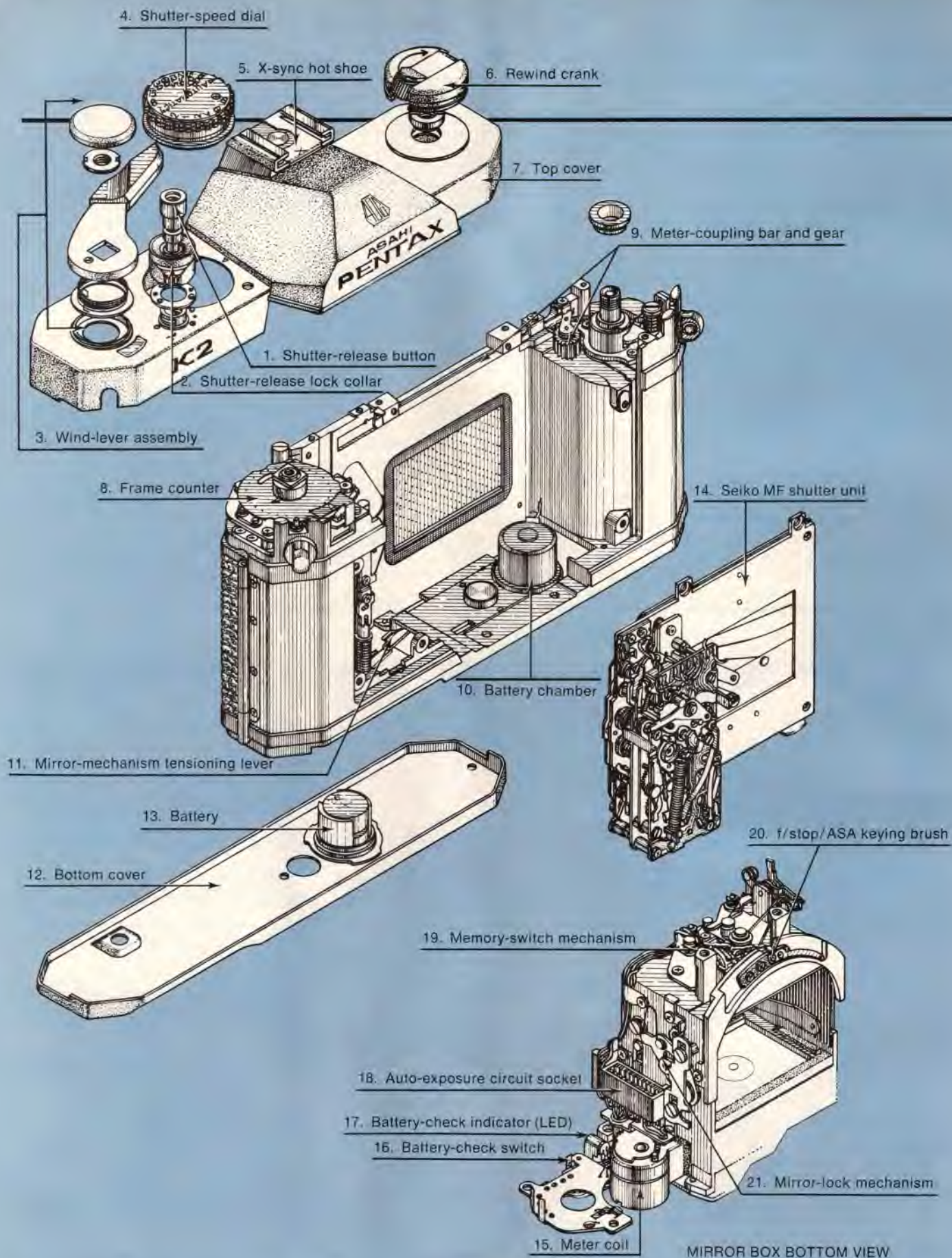
**White's better than yellow:** Early print faded and turned yellow within 3-4 years (left). Same negative printed in 1950's maintained whiteness (right).



**1972 Kodacolor II gets it all together:** Today's negative color film produces negatives vastly different in makeup and color from those of 1942, offering far better grain structure and sharpness, and a continually improved orange-red mask capable of producing top-quality commercial pro prints. Compare 1942 fruit with present print.









**The bayonet mount is new, the aperture-preferred auto-exposure system well proven, but behind both lurk important advances in electronic information transferring.**

Asahi Optical Co. has maintained its position as a leading 35mm SLR producer since their introduction of the 1955 Pentax, which incorporated the world's first instant-return mirror system. It therefore came as no great surprise that the first aperture-preferred auto-exposure SLR, the Honeywell Pentax ES, was also a product of this innovative factory. Indeed, many current auto-exposure cameras use the patented Pentax ES memory circuit in their camera's metering system (and pay Asahi a substantial royalty for this privilege).

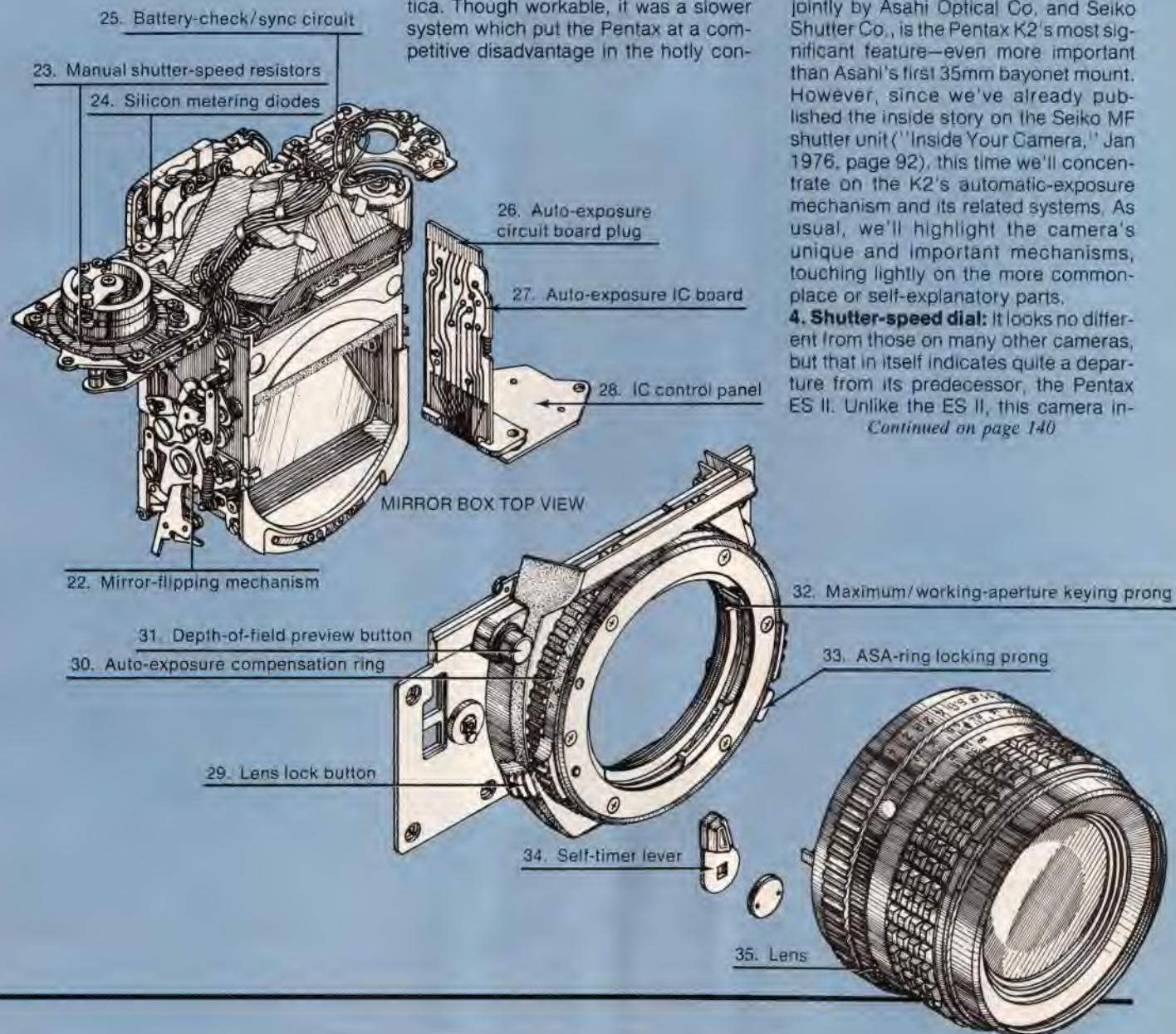
But even this giant of SLR-dom had an Achilles' heel—its screw-thread lens mount inherited from the German Praktica. Though workable, it was a slower system which put the Pentax at a competitive disadvantage in the hotly con-

tested "prestige" SLR field. And so Asahi made the logical move and jumped aboard the bayonet-mount bandwagon.

In fact, they did much more, for when Asahi announced its first bayonet-mount model, the Pentax K2, in July 1975, it fairly bristled with new and outstanding features. For example, the K2 incorporates a brand new proprietary focal-plane shutter, the Seiko MF. This vertical-travel, metal-focal-plane unit is only the fourth of its kind ever produced and, practically speaking, only the third usable one (the first being the famed Copal-square, the second in the Praktica LLC and VLC). Undoubtedly, this shutter unit, which was developed jointly by Asahi Optical Co. and Seiko Shutter Co., is the Pentax K2's most significant feature—even more important than Asahi's first 35mm bayonet mount. However, since we've already published the inside story on the Seiko MF shutter unit ("Inside Your Camera," Jan 1976, page 92), this time we'll concentrate on the K2's automatic-exposure mechanism and its related systems. As usual, we'll highlight the camera's unique and important mechanisms, touching lightly on the more commonplace or self-explanatory parts.

**4. Shutter-speed dial:** It looks no different from those on many other cameras, but that in itself indicates quite a departure from its predecessor, the Pentax ES II. Unlike the ES II, this camera in-

*Continued on page 140*





by Lyle Lawson

# Statue of Liberty? You're kidding!

It's there, friends— and if you get to it, photograph her right.

**To Get There:** Parking facilities are sparse; leave cars elsewhere; use public transportation. From the East Side (by train): Lexington Ave. IRT express subway to Bowling Green; change to South Ferry Shuttle. By bus: 2nd Ave. No. 15; 5th Ave. No. 1. From the West Side (by train): 7th Ave. IRT Express to Chambers St.; cross platform and enter *first* or *second* car of local since these are the *only* ones whose doors open at South Ferry. By bus: 7th Ave. No. 6. Fare: 50 cents.

From South Ferry, walk to the boats; first one leaves at 9 A.M. If you're a nut about people-free photos, catch this one. From Sept. to May, boats run every hour on the hour; in summer, sailings increase to every half-hour. Round trip: \$1.25 for adults, 50 cents for children.

**Necessary Equipment:** A 35mm lens won't do; you'll need a 28mm at least; a 21mm or shorter lens is dandy. A tele, about 200mm, gets all the close-ups. An extra-long tele, around 500mm, lets you make a personal statement. We suggest a 50mm for the museum if you're using Tri-X. Have a favorite medium tele? Bring it.

**Always** keep a haze or skylight filter on each lens; water and light factors are a problem. In bright light, add a polarizing filter. Clouds can be fantastic; keep a yellow filter handy for b&w shooting. Two rolls of color and one of b&w film are sufficient. Overall, Kodachrome 25 and Tri-X work best. There's no need to carry a light meter; use your camera's system.

**Best Places to Shoot:** Don't bother with two upper terraces at the statue; the promenade level has super unobstructed views, up and outward. Climb to the crown; it's only 12 flights, and there are several breath-catching rest stops. Pay no heed to the crowds and cramped space.

With so many trees on the island, you can stand almost anywhere and photograph through them.

**Other Points of Interest:** The Museum of Immigration contains an engrossing mini-history of the nationalities who settled this country. Flash is permitted, or push Tri-X to 800.



In the museum: a kaleidoscopic alphabet of immigrants. 105mm, f/2.5, 1/15.



Can't get there? Ride the Staten Island Ferry. 500mm mirror, f/8, 1/125.



Is the statue standing on the afterdeck? A 500mm compacts and foreshortens, so who knows? A lucky moment early one morning at Battery Park. f/8, 1/60.



A 21mm creates a unique view from the crown. f/11, 1/125.



Lean out a crown window. A 200mm brings the book in close. f/8, 1/125.



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## Bicentennial "Shoot America" Series

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Springtime, flowering trees, a solitary sailboat, and no people. New York City? Yes! Wander around Battery Park before and after working hours. No one will disturb you. 500mm mirror,  $f/8$ ,  $1/60$ .



What does Miss Liberty's foot look like? With a 500mm, you know,  $f/8$ ,  $1/500$ .



Classic and corny, but it tells the story. From the promenade. 105mm,  $f/8$ ,  $1/60$ .



Be patient, there may be some long waits for late-afternoon shadows. In the morning, shoot out the other side of the crown to achieve the same effect. 200mm,  $f/8$ ,  $1/60$ .



**Off the Island:** A 50mm is okay from the Staten Island Ferry, but a longer tele is better. Sunsets are easy *if* they're timed properly. Check the weather bureau; then catch a ferry 10 to 15 min. before the sunset.

The most spectacular view of Liberty Island and New York City is from the observation deck of the World Trade Center. It's scheduled to open in February, 1976.

There are 2-hr. harbor cruises available on *Petrel* (\$8 at this writing), a 70-ft. yawl berthed at Battery Pier,

not far from the island boats. No private boats may dock on the island, but *Petrel* takes a close look. Check dockside for particulars.

Feeling flush? New York Airways can whisk you over and around the statue. Flights last 30-60 min.

Commuting between New York and New Jersey airports? The helicopter flies within winking distance of the island. A 50mm works well: westbound, sit on the right; reverse for eastbound. Fare from LaGuardia or Kennedy to Newark: \$27.78.

Everyone takes pictures, so snap one of the picture takers. 50mm,  $f/8$ ,  $1/60$ .



# How Much Lens Light Falloff Is Too Much?

What causes light falloff in your picture corners? How can you measure it and minimize it.

by Hiroshi Kimata

You are critically examining your color slides or prints. You rejoice in their composition, perfect exposure, sharpness. But they do seem to have some odd characteristic that wasn't in the original scene, which bothers you. Suddenly you have it: the center of the picture is actually lighter than the corners! Or, to put it another way, the corners get progressively darker the farther away they are from the center. In the center there may be a real hot spot. At the edges or corners, the exposure may even be two to three f/stops less than the exposure at the center.

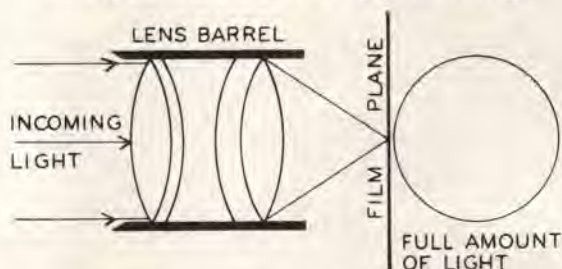
Granted there can be times when such a vignetting of illumination at the edges and corners will not only be inconsequential but will actually add to the dramatic quality of the picture, drawing the viewer's eye centrally. The opposite, however, may produce a blue sky which unaccountably appears darker at the edges and corners, raising skepticism among viewers that perhaps you have toyed with the photo.

What caused the difference between the picture center and the edges? Was it an improperly fitting lens hood or filter? Probably not. You could instantly trace such an occurrence to note whether or not you used such an accessory.

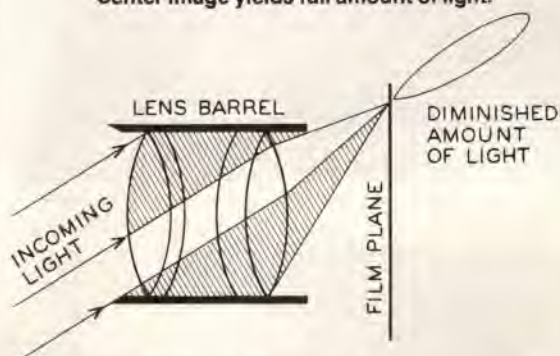
Was it then an optical defect? The answer is no. While it was caused by the lens, such light falloff is common, (worse in some types of lenses than others) and can usually be corrected adequately by selecting the proper lens aperture. However, it's true that some lenses do inherently produce more corner falloff of illumination than they should. While light falloff in lenses has always been with us, today's concentration by lens makers on wider angles, larger apertures and more compact lens barrels has increased the seriousness of the problem to the point where MODERN feels photographers should take it into consideration just as much as they would sharpness or contrast or distortion.

It's a simple matter for you to check your own lenses (whether bought or about to be bought) for some important falloff defects—and we will tell you how to go about this in more ways than one. What we all want to establish, however, is some criterion for the maximum amount of light falloff that lens makers should allow and you should accept. But in any

## Major factor: Vignetting



Center image yields full amount of light.



Lens barrel edges cut off edge rays, make an ellipse.

## Check vignetting yourself



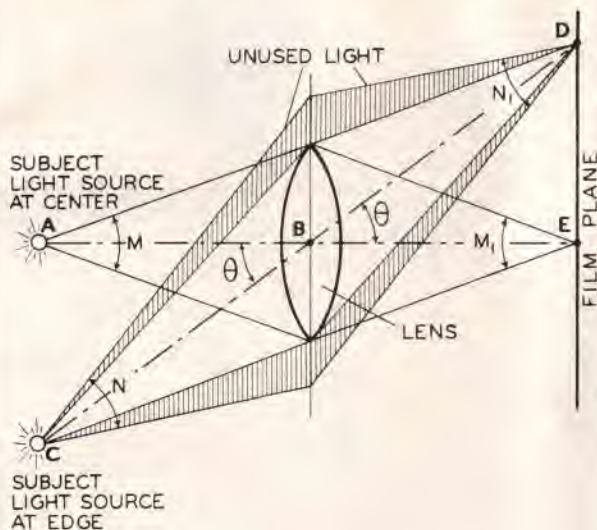
Some black paper with holes is all you need: Follow directions given in text, tape over the film plane.



Non-circular image shows vignetting: Slide projector light projects center and corner light rays through lens onto paper. Circle shows light from center of picture and ellipse from corner. When lens is closed to point where two projected images are same size circles, vignetting disappears.



## Sticky factor: Cosine 4th



**Don't hide under the rug!** It's really simple. There's no problem when the subject light source at center (A) travels perpendicularly through lens (B) and converges at film center (E). However, when the light comes from a subject at edge (C) and enters the lens at angle ( $\theta$ ), the edges of the light bundle can't get through the lens even if there is no lens barrel obstruction. This light can be seen above as "unused light" with gray shading to the left of the center of the lens. However, the very same problem occurs on the right side of the lens. The angle  $N_1$  also cannot see all the light coming through the lens and consequently loses a cosine  $\theta$ 's worth. This is shown as the gray areas to the right of the center of the lens. The third and fourth losses occur because the distance between points (C) and (D) are longer than between (A) and (E). These are the four factors which make up the cosine fourth law regarding loss of light. It remains regardless of the aperture and cannot be changed by optical engineers — although they can compensate for it (see text).

event, MODERN will chart for you this light falloff with every lens tested from now on.

What causes light falloff in lenses? It's a combination of four factors, two major ones and two minor.

One of the two major ones is vignetting. While the word "vignetting" has been used loosely to describe all light falloff, in strict optical terms vignetting is actually the light falloff at the edges or corners of a picture caused by the masking off of light rays by the edge of the lens barrel itself.

The bundles of light rays from the subject which enter the lens centrally form a perfect circle at the film. But the same size bundle which is at the edge of the picture and comes into the lens at an angle has part of its circle clipped off by the front of the lens barrel. (See diagrams on page 88.) Naturally the amount of eclipse increases as the angle of the light rays entering the lens increases and the bundle of light rays becomes thicker. In other words, light falloff increases the wider the angle of the lens and the larger the aperture.

A third factor causing vignetting is the optical makeup of the lens: the number of glass elements, their composition, and the size of the glass elements.

The lens designer can play with all three factors—producing a larger lens barrel, a smaller maximum aperture or

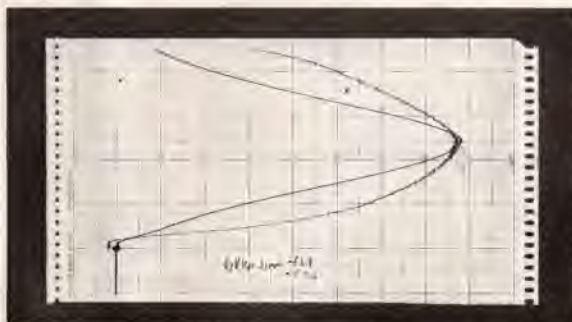
## How MODERN checks it all



**Essential optical test element: traveling microscope.** Diffuser over microscope allows it to scan light at film plane after all light passes through lens.



**Putting it all together:** Bennett Sherman runs our internal light-falloff measuring machine. Light box provides diffused illumination to lens where light falloff is measured by microscope which transmits information to photomultiplier at right end of scope. Photomultiplier creates light-falloff curve which is drawn by automatic recorder on graph paper.



**Results: Light falloff in graph form.** Light falloff from center to picture corners is actually generated in percentages, but we've redrawn all graphs to show light falloff in f/stops, center to corners (see next pages).



## Lens Light Falloff (cont.)

a different lens formula with different glass. However, once you, the user, have a lens, you have only one control. By using a smaller than full aperture, you can minimize vignetting and perhaps eliminate it almost completely. At what point will vignetting possibly disappear? At the  $f$ /stop whose diameter is smaller than the cutoff edge of the bundle of rays at full aperture.

Just how do you go about setting up a test with your own lens? First grab a millimeter ruler and a piece of black construction or art paper. Cut out a rectangle measuring about 35mm x 45mm. Draw on it in pencil a smaller rectangle of about 24mm x 36mm. Draw diagonals from corner to corner. With a pin, make a tiny hole at each corner. Make a larger hole (1mm in diameter) right in the center and another 1mm hole 19.4mm from the center toward one of the corners. (This is all easier done than said, as you can see from the photo in the center of page 88.) (If you're using a camera other than a 35mm, position this hole from the center .45X the diagonal length.)

Now tape the paper to the film plane of the camera (as shown in the photo on page 88) so that the corner pinholes are right at the very corners of the film plane of the camera. **WARNING:** Avoid the very obvious, simpler method of putting the paper on the camera first and then poking the holes. You might poke a hole through the shutter. Poke your holes first!!!

## Need light? Use slide projector

Open your camera shutter on T or B and keep it open. Set your lens to full aperture. If the paper is properly aligned you should be able to see the light through the pinholes at each corner. Once the paper is aligned, tape the four corner holes shut with black tape. These holes are no longer needed. Before we get underway with our 1mm holes, we've gotta diffuse 'em. Take tiny pieces of tracing paper and tape them over the pinholes — two thicknesses over the central pinhole and one over the corner pinhole will do. Illuminate your open camera from the back with a bright light source such as a slide projector (as shown in the picture on page 88). Position a sheet of white paper directly in front of the camera lens. You may see one complete central disc of light and an overlapping ellipse similar to the one we've shown on page 88. The ellipse represents the total bundle of light rays reaching a point near the corner of the picture from the pinhole near the corner of the film plane. The complete disc is the light bundle reaching the picture center. The amount of vignetting is expressed as the ratio between these two light bundles (or, the ratio between the two lighted areas on the piece of white paper located at the front edge of the lens barrel).

How far down must you stop your lens to eliminate vignetting? Close the lens aperture until both disc and ellipse become the same shape and size. Normally, from that lens opening on to the smallest aperture, vignetting will be eliminated entirely. As

## How much light falloff appears in typical lenses?

To show you just how much illumination falloff actually shows up in various lenses, we gathered eight, from ultra-wides to tele zooms, tested them for vignetting (as described on page 88) at full aperture and  $f/5.6$  (usually), made actual bright-sky pictures to see the practical falloff on film and, finally, made falloff charts. Therein we indicated center-to-corner falloff on the horizontal axis and  $f$ /stop light falloff vertically. The heavy line represents full aperture; the dotted line, stopped-down opening, and the thin black line, cosine-fourth-law effect (which we calculated mathematically). We've included this curve showing the cosine-fourth-law limit because it represents the theoretically optimum falloff performance possible for any lens, and you can therefore use this curve as a standard. This thin line doesn't appear for lenses over 100mm focal length since cosine-fourth-law light falloff is virtually non-existent there. Vignetting tests often appear better than sky shots or charts because vignetting edge disc tests are traditionally made at 90 percent distance from center to corners, not in exact corner. At 90 percent point, vignetting tests and charts generally agree. Our final recommendation: shoot the north sky with your lenses at all apertures to check total light falloff for your own equipment.

usual, however, there are exceptions. In some zoom lenses, vignetting actually gets worse at smaller apertures. With such lenses you may achieve better overall illumination at larger apertures than at smaller ones.

While using a white piece of paper to produce the center circle and the edge ellipse may be all you want, you can also make a permanent record of it on film. Fasten a piece of cut film or enlarging paper to the lens front instead of the sheet of white paper. (Do this, of course, in the dark.) Expose the film or paper, then develop it. Cut out the pattern of the center and edge and lay them down on graph paper. Count the number of squares each covers. Divide the squares of the corner ellipse by the squares of the center circle. That's your vignetting percentage.

## Wide angles can be reversed

Zoom lenses aren't the only ones which may give you curious results. With some wide-angle lenses the corner ellipses may actually be larger than the central disc! While this may happen even with regular lenses (for reasons we'll see), it usually occurs in wide-angle lenses, most of which today use so-called inverted telephoto (or retro-focus) designs. With such wide angles, the angle of the incoming light rays and the angle of the outgoing light rays from the rear end of the lens are different—and so is the amount of illumination of the central light rays and the corner rays. Thus, with most SLR wide-angle lenses, vignetting is

## 20mm $f/5.6$ for RF's



Typical old-style ultra-wide design



$F/5.6$ : No vignetting, equal spots.



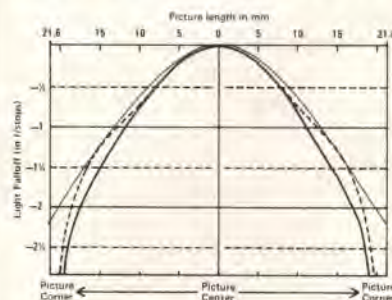
$F/8$ : No vignetting, spots still equal.



$F/5.6$ : Dark corners show light falloff.



$F/8$ : Corners dark but rest improved.



Although vignetting in mid-picture tested out to be absent, corner darkening at  $f/5.6$  appeared acute, partially caused by cosine fourth law.  $F/8$  showed mid-area improvement.



## 20mm f/3.8 for SLR's



Inverted tele ultra-wide angle



F/3.8: Spots equal, no vignetting.



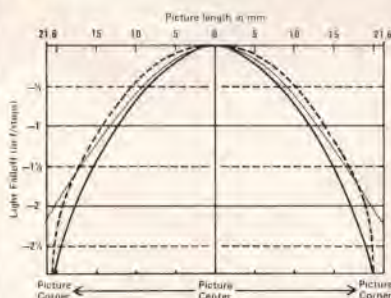
F/5.6: Corner spot larger.



F/3.8: Central hot spot.



F/5.6: Improvement over f/3.8.



Light falloff in corners at full aperture (thick line) was great, but not as acute as 20mm f/5.6. Note f/5.6 (dotted line) improved in mid-area but remained bad at corners.

## 50mm f/1.4 for SLR's



Slight inverted tele design



F/1.4: Obviously much vignetting.



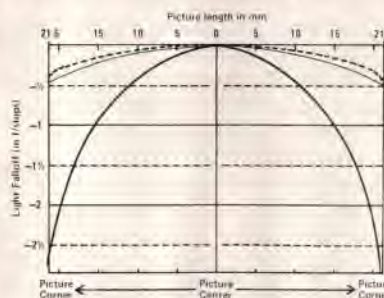
F/5.6: Vignetting absent.



F/1.4: Unmistakable hot spot.



F/5.6: Hot spot completely gone.



Effect of closing down lens is obvious. Look at difference between f/1.4 (heavy line) falloff in corners (almost 2 1/2 f/stops) as compared to f/5.6 at less than 1/2 f/stop.

## 200mm f/4 tele for SLR's



Typical telephoto design



F/4: Definite vignetting.



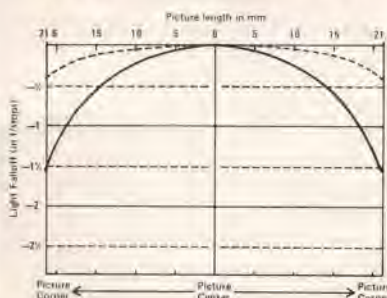
F/5.6: Less edge-center disparity.



F/4: Noticeable hot spot in sky.



F/5.6: Evenness better, not perfect.



At f/5.6 (heavy line), severe corner falloff of 1 1/2 f/stops was caused by typical long barrel of tele lens. When at f/5.6, falloff improved. Cosine-fourth-law line is above graphs.



## Lens Light Falloff (cont.)

reversed. The corner of the picture receives more light than the center area (if all other light falloff factors are not considered).

Well, so much for vignetting. Alas, that's not the whole story of light falloff. We said there were four factors. Vignetting is certainly a major factor. Two others we'll discuss are minor. But another major factor goes by the confusing name of the cosine fourth law. Because this factor is a real tangled one, we've asked Bennett Sherman to delve deeply into it in his column (see "Techniques Tomorrow," page 58). Here we'll skim lightly over it.

As you see in the illustration on page 89, the light rays at the edge of the picture cannot pass through the lens aperture entirely, like the central rays can. The lens opening seen from the angle of the picture edge is smaller than the aperture seen centrally which is perpendicular to the aperture.

This causes some off-axis light loss, depending on the picture edge angle. And it's just the start. More light is lost at the other film end. The film is perpendicular to the lens center, but it is at an angle to the edge light rays. When the entire aperture-light-ray bundle from the edge hits the film plane, the size of the bundle is smaller than that of the central rays (as you see in the illustration). Here, once again, light rays lose brightness. But the loss doesn't stop here. As you may have noticed in the illustration, the distance between the subject and the film plane is greater at the edge light path than at the central light path. More light loss. Counting up all the losses, the combined final loss is cosine to the fourth-power's worth—but don't take our word for it. Let Sherman explain it.

### You can lose 70% of light!

Just how much light is actually wasted in practical picture-taking terms because of the cosine fourth law? Let's take an example. Thanks to the cosine fourth, a 50mm lens loses about 30 percent (or 1/2 stop) of the light at the corners, regardless of lens aperture. A 24mm lens loses as much as 70 percent of the light, or 1 1/2 f/stops of light, at the picture corners because of this cosine fourth law. If you consider that the exposure latitude of normal color film is, at maximum, 1 1/2 f/stops, but even a half-stop exposure error can be noticed, you can understand why this light falloff is serious.

Since optical engineers cannot change the laws of light or optics, there is very little they can do to reduce edge light loss caused by the cosine fourth law, except in cases where a somewhat inverted telephoto lens design is used. Oddly enough, even though we normally think of inverted tele designs as being employed only in wide-angle lenses, we have found that a number of other lenses—even normal ones such as the 50mm f/2 Nikkor—use some elements of an inverted telephoto lens design. With such a design, an optical engineer can use one factor to compensate or even improve on the other. In inverted tele designs, vignetting is sometimes reversed—that is, the center

receives less light normally than the edges. But the cosine fourth law factor always remains in effect, giving less light to the edges. By balancing the vignetting factor against the cosine fourth law factor, designers can compensate for the cosine fourth law effect—or even improve on it. You will be able to see this quite often in our graphs, where the actual light falloff will be less than the cosine fourth law, thanks to good engineering use of the vignetting factor.

So much for the major factors of vignetting and the cosine fourth law. How about the two minor factors? First, there is light absorption of the glass itself. The bundle of light rays from the picture edge goes through the glass at a greater angle than the central rays. The rays therefore go through more glass, and more light gets absorbed. In the same manner, the amount of light reflected from the glass and not transmitted increases with the angle; so again, less light gets through the lens from the edge.

We do not consider these two last factors nearly as important as the first two, but they do deserve mentioning and they can be minimized by optical engineers, depending on the lens construction.

Since our vignetting test only reveals to you one of the two major factors, and doesn't go to the utmost corners of the picture, how can a test be devised to show the entire picture's light loss? A photographer can, of course, do the logical and practical thing—take a picture. Simply wait for a cloudless day and photograph the north sky at all lens apertures with a color film (since it has less exposure latitude than a black-and-white film). Then examine the transparency over an absolutely evenly illuminated screen, noting the edge light falloff and at what aperture it either ceases completely or is reasonably minimized.

### Practical tests are O.K., but . . .

Unfortunately, while practical picture tests can tell you that there is light falloff, there is no easy way of measuring how much there is, whether directly from the transparency or slide, because the contrast characteristics of the film are now involved as well. Ergo, if you want a quantitative report on total light falloff, you'll have to leave it to MODERN to do the testing, since we have developed a photoelectronic device to measure the light falloff, which takes into account the four light-falloff factors. You can see our new instrument on page 89. The instrument measures an evenly bright light source in front of the test lens covering the lens's entire viewing angle. Behind the lens, we place a traveling microscope with a flat diffuser at the microscope's focusing point. Then move across the lens's simulated film plane driven by a synchronous motor. The light seen by the microscope is now relayed to a photomultiplier through a slit and converted into an electric current. The current is recorded by an automatic recorder registering all light falloff at all lens angles from the center to the very corner of the film format. On page 89 you

## 28-45mm f/4.5 at 28mm



Inverted tele wide-angle zoom



F/4.5: Edge spot slightly larger.



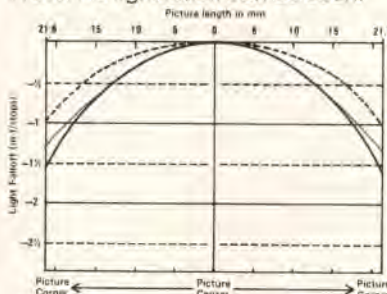
F/5.6: Edge spot comparably larger.



F/4.5: Definite darkening in corners.



F/5.6: No light falloff can be seen.



At full aperture, corner light falloff of 1 1/2 f/stops was about the same as cosine limit—very good for a zoom. Stopping down to f/5.6 was better, with light loss of 1 stop to corners.



## 28-45mm f/4.5 at 45mm



Inverted tele wide-angle zoom



F/4.5: Obvious corner vignetting.



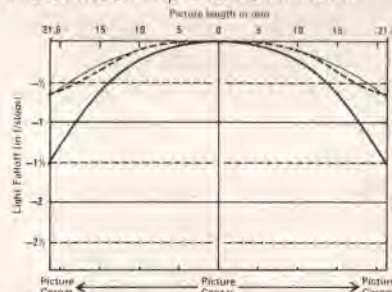
F/5.6: Corner vignetting improved.



F/4.5: Obvious central bright spot.



F/5.6: Much improved evenness.



Virtually a repeat performance of 28mm setting at f/4.5, but inverted tele design really picked up edge and corner performance at f/5.6 to only about 1/2 f/stop light loss.

## 80-200mm f/3.5 at 80mm



Mechanically compensated zoom



F/3.5: Edge better than expected.



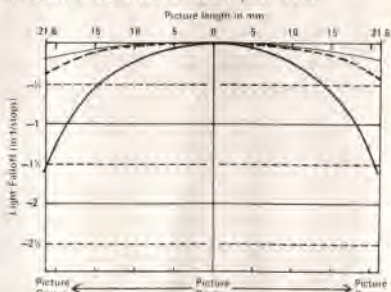
F/5.6: Edge virtually equals center.



F/3.5: Obviously much falloff.



F/5.6: Evenness near perfect.



Falloff at full aperture (heavy line) showed loss of 1 1/2 f/stops. But at f/5.6 (dotted line), falloff was reduced to less than 1/2 f/stop, amazingly good for tele zoom lens.

## 80-200mm f/3.5 at 200mm



Mechanically compensated zoom



F/3.5: Vignetting bad as 50mm f/1.4.



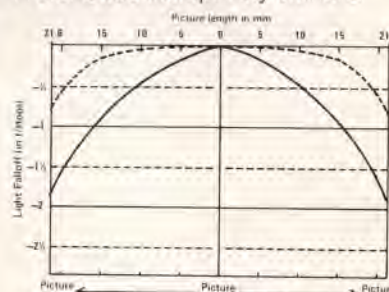
F/5.6: Edge vignetting improved.



F/3.5: Distinct hot spot in sky.



F/5.6: Good except very corners.



At f/3.5 (bold line), falloff in corners reached nearly 2 f/stops. (Compare with far better 200mm single-focal-length.) Closing to f/5.6 (dotted line) brought falloff to 3/4 f/stop.



## (PART TWO)

# The Harbutt Workshop The Shutter

"Shutters, like seducers, have two basic techniques: the stare and the wink."

"Both how long and when the exposure is made can form the look of a final picture."

"Photographs occur at the precise moment when a person, a camera and the world interconnect."

"The most timeless photographs may actually be the most timely."

Bakers know that what starts as a pudding can end as a cinder if they don't pay attention to time. Time itself is part of the cooking process. It's part of photography, too. How long you expose makes pictures come out well, badly, or not at all.

In media other than photography, neither the duration of creation nor its real, historical instant have much importance. A sonnet can take a minute or a year to write—any minute, any year. But shutters snap for very precise durations and at actual moments in real time: both *how long* and *when* the exposure is made can form the look of a final picture. Photography's special character as a medium flows partly from this look of time in the image: day or night, morning or afternoon, 1907 or 1970.

Shutters, like seducers, have two basic techniques: the stare and the wink. Slow films and lenses forced long exposures on early photographers like Atget, who made a great effort to develop the stare's nuances—the subtle changes in imagery wrought by where he put his lens. The images also reflect what the shutter actually did to make the picture; it was open for a long time one afternoon at the turn of the century. Frequently, the pictures include the characteristic (and uniquely photographic) long-shutter blur, a blur in which the background bleeds through the blurred movement.

Today, photographs can be made in milliseconds. Struck by a particularly complex image, a viewer once asked Garry Winogrand how long it took him to be able to make such a picture. Garry's response: "A 500th of a second."

The action of the shutter can best be understood with a little experiment. Close your eyes and move your head from side to side and up and down. Then, click: open and close your eyes very quickly. Zap! That's what it looks like inside a camera when the shutter goes off.

Most people experience a rush of light, a jumble of forms and colors, the simple sensation of seeing. Many contemporary photographs primarily explore the consequences of this simple, visual experience, this feeling of the shutter, this energy. The pictures flow from that quick moment when the eye simply sees, before the mind has given meaning or found design—when the experience and the person experiencing are fully, intuitively, existentially *there*. Such images look like photographs, not paintings. They are jottings more than tomes. They flirt with chance, with quick emotion from an uncertain cause.

Closed eyes are the state of dreams; only interior visions are possible then. When the eyes are open, awareness of the interior world is still possible, but visual confirmation of the external world is *only* possible with open eyes. A contemporary version of the thumb-screw confines a prisoner to a darkened room; the resulting disorientation can plunge minds into insanity.

One student of mine said that, when she blinked, she not only noticed that the world was still there, she also noticed *she* was still there. Part of how we know who and what we are comes from knowing where we are. Where am I? What day is it? The photographic moment is akin to the moment of true vitality described in psychiatry when one is fully in touch with oneself and one's world.

Photographs occur at the precise moment when a person, a camera and the world interconnect. Each part of that collision has its



own reality, its own set of times: our personal lives row along merrily (or otherwise), the world paddles its own canoe, and the camera shutter blinks and blurs. All three times can mark the final picture and produce images uniquely photographic in their feel and form. Such images show their parentage: they look like how they were made. So the most timeless photographs, those which endure the longest, may actually be the most timely, the most full of time.

The wink of a shutter seduced Jacques Henri Lartigue into his lifelong affair with photography. Given a camera at age six, he had a visceral instinct for photography's pulse—the shutter. And if he ran out of film, he would blink at whatever he wanted to remember and sketch it later in his diary. Whether puckish child, peeping adolescent or aspiring *boulevardier*, Lartigue's own personal time stamps his image. His book, *Diary of a Century* (currently out of print), is just this: the first photographic autobiography of our changing era. Both its individual pictures and its overall sweep are suffused with the various kinds of time photography can contain.

## Lartigue suggests the shutter's possibilities

**Use fast shutter to stop action.** Much of Lartigue's pre-teen work, like this picture of a "Mary Poppins" cousin flying out of the house, shows a love of the camera's ability to stop action and freeze the energy and flow of the world. Lartigue's boyhood camera giggled with delight at the outlandish energy of adult busyness. Many of his pictures stop life at impossible moments: blimpish uncles float over ponds; balls hover forever; the world leaps, bounds, falls, leans and pushes.

But Lartigue's ray-gun camera locked the energy at its most volcanic point. The real action could not have stopped there; it had to move on or explode. Lartigue's snapshots dance with Faulkner's sense of art: "The goal of every artist is to stop movement, which is life, by artificial means and to maintain it fixed so that, 100 years later, when a stranger may gaze at it, it will once again move, because it is life."

Action stopped at moments of peak energy or ambiguity is a specialty of the shutter and of photography itself. Such moments weren't painted because they couldn't be seen. Muybridge's studies were the first to show how movement actually looks: that all four legs of a galloping horse are off the ground simultaneously. A shutter can be a tool to make reality visible, to see the unseeable, to expand the duration of a millisecond to a millenium (given archival processing).

**Capture emotion and composition simultaneously.** Just as Atget explored the enormous difference a millimeter's change of angle can make in the final print, so Lartigue knew the shutter question: "How is this moment different from any other?" (There can be multiple answers—influencing both form and content.) In this picture of a fashionable woman in the Bois de Boulogne, Lartigue's shutter finger pointed to a moment of clarity in the jumble of movement: the instant when the woman's form stands out graphically from its background. A moment earlier, and the carriage at right would have overlapped the woman; seconds later, and the car at left would have done the same.

But more likely, Lartigue, wide-eyeing the bosoms and bustles of the Bois, hoped to be noticed by such a beauty and, when she smiled, found an order in the world. In any case, it was a moment of meaning as well as design, a moment when the woman could clearly be seen as the subject of the picture both visually and because of the emotion her expression and posture projected.





What Lartigue did by instinct and intuition, Cartier-Bresson later theorized and photographed in the *Decisive Moment*: "To me, photography is the simultaneous recognition, in a fraction of a second, of the significance of an event as well as of a precise organization of forms which give that event its proper expression."

Not only can shutters hold the jetsam of life in meaningful visual balance, they also can suggest relationships that don't really exist. Strangers in the night can meet, not just pass, in a shutter's flash. Forever framed, their passage acquires a weight we flesh out with our fancy.



**Use slow shutter plus pan to produce unique blur.** In the evolution of handiwork artists, from stick animals on cave walls to paint dribbles on museum walls, not one ever thought to draw a moving vehicle as Lartigue's shutter did in this racing picture. Even artistic license can't drive a car with an oval wheel, yet we go with this speeding photograph. We even blithely accept gravity's refutation by the leaning, pre-Chagall spectators.

The picture's charm and believability flow largely from the simple, technical shutter graphics. There is both stop-action focus and blur in one frame. The blur comes from two sources: the wheel, which was spinning too fast for the set shutter speed; and the camera, which was panned with the action while the shutter moved vertically across the film. The latter caused the curious, step-like, gravity-defying angling of the spectators. The print looks like it does because a shutter was used to make it. Part of the fun is that, in this *jambalaya* of oval wheels and an off-kilter world, the spectators actually peer eagerly at what is next coming down the pike.

This kind of shutter graphics has nearly infinite possibilities, it all depends on the direction and speed of the subject's movement (if any), the shutter's design and speed, and the direction and speed of the pan or jiggle of the camera (if any). Ernst Haas's famous blurs grew out of extensive experiments. For example, most 35mm cameras have shutters that move horizontally, but there will be different graphic results if you pan with the direction of the shutter or against it—horizontally, vertically, or at an angle to the action.

Even without pan or jiggle, if the shutter speed is too slow for the action, a uniquely photographic effect occurs in which the background can be seen through the blur. Artists draw this blur effect as a line obliterating the background. These unique graphic effects are photographic graphics. Lartigue himself acknowledges this concept when he says: "I have two pairs of eyes—one to paint, and one to take photographs. There is little relationship between the two."



**Communicate time of day or season.** The world goes on day by day, morning into night, winter into spring, but the dew of some mornings sparkles with such delight that dogs leap in the air and Lartigue clicks his shutter (and his heels) in sheer vital communion. Photographs can communicate and crystallize the mood of a particular time of day or season of the year. The instant which made them, whether August noontime torpor, winter's silence or night's fears, can live on in the photographs and continue to give them life.



**Convey feeling of an era.** Longer time spans also have their moods; Lartigue lived in the F. Scott Fitzgerald era of steamer travel, Riviera nights and brooding elegance. But his turn-of-the-century pictures have the romanticism of the war to end all wars, and his 40's images suggest the harsh vulgarity of a downtown parking lot. Lartigue's pictures can be roughly dated not only from the fashions and fads their subjects display, but from the sensibility the photographer projects. They are of their time, both in content and attitude.



**Picture important events of our time.** For a photograph to be of World War I, it had to be made *during* World War I. Heroic sculptures must be done later to show how the general's horse stood, depending on how the gentleman died. Paintings can be done anytime. This picture contains internal evidence that it could only have been made during a war early in this century. Such Red Baron biplanes were first and only used in the "War to End War."

For Lartigue, the events of his time were not just far away rumbles; he marched to their drumbeat.



**Show emotional interactions.** Things happen in the real world; cars crash, children build sand castles and, as Lartigue noticed, old men twist their legs in pleasure at charming a smile to the lips of knowledgeable old women. Shutters can click at such moments; photographs can capture real emotions really felt. Some photographers forget this unique capacity of the camera and feel they must stop the world, ask its permission, then pose and pre-visualize it before making a photograph. But unlike dramatists, photographers need not manufacture emotions and events; they can show life—even intimate, personal exchanges—as it actually unfolds.

The composer Louis Horst once said art was the last refuge of the bored; dissatisfied with this world, artists create new ones. Lartigue's shutter points to another possibility: photographs can confirm that the world *is* vital, that interesting things *do* happen, sometimes.



**Make note of private events.** What people love about photography is the chance it gives them to preserve some moment in their lives so it can be savored and re-savored in future times. As every Grandma knows, her box camera is a time machine; once she clicks her shutter, nothing can take junior in the sandbox away from her. Junior can grow long hair, marry the wrong girl, forget to write, and play the horses, but Grandma will always have him playing innocently in the sand.

This universal charm delighted Lartigue's aristocratic family, and they posed for their snapshots with wit. Ensnared in his outlandish tire-boat, brother Zissou drips elegance and *savoir faire*.

The visual life is like an endless movie, each still a single frame. All moments, public as well as private, can be photographed. Every choice of what and when to photograph reveals self, but photographs of private moments are directly about one's actual life. Avedon's photographs of his father are not just of some old man, but charged with Avedon's complicated and pained reaction to his father, dying.







**Record things which remind you of your memories.** Lartigue's picture of a child on a pony is suffused with such nostalgia that I cannot help but feel the scene sparked memories of his own childhood. Personal time is continuous: although on one level we may be conscious of what is happening in the external world, any given event can trigger such powerful associations that we may simultaneously live in past dreams, fantasies or memories. Ralph Gibson has tried to explore some of this perceptual double time in his books, *Déjà Vu* and the *Somnambulist*. Events and things in the external world may also be such perfect equivalents for our internal, even subconscious, concerns that we make pictures of our mirrored image.



**Try sequences to communicate passage of time.** One's life always has a chronology and, with enough hindsight, possibly a development. Lartigue's book explores this passage of time, not only because image follows image in linear sequence, but because he chose the course of his life as the thread. Pictures from his 50's could not appear amid pictures from his teens; both content and attitude are too marked with time.

Photographers have always been fascinated about images in sequence influencing one another. This montage effect is the heart of cinema and most picture books, but their sequencing is arbitrary and for effect only. Lartigue's book has "real time" sequencing as well as media sequencing.

But beyond the simple fact that the sequencing is real, Lartigue's diary is also personal and intimate; it's concerned with his real woes and delights, more or less as they happened. The drive to have his photographs truly be a diary of his life reached a crucial level of self-revelation when he photographed his wife dancing with another man. Perhaps the distance of age made it possible for him to publish these pictures of the dissolution of a marriage and the intimate detailing of his relationships with women, but it is the drive and compulsion to have his work reveal his life explicitly that was the originating impulse to shoot them at all. Lartigue achieved a brave and personal integration of his time, his world, his life and his craft.

A precocious and privileged child, viscerally attracted to the camera, Lartigue grew into a sophisticated photographer who persevered in giving a precise and moving meaning to the idea of personal photography. He recently said: "I take photographs with love, so I try to make them art objects. But I make them for me first and foremost—that is important. If they are art objects at the same time, that's fine with me. In fact, it is what I write in my diary that excites me most: I write with love, and try to express things the best way I can."





## Here are seven assignments which suggest ways you can explore your shutter's potential.

1) Experiment with different shutter speeds and camera movements on a particular action, like moving people. Sometimes, with today's high-speed films, a neutral-density filter must be used in order to utilize the slower shutter speeds outdoors.

2) Take a picture that could only be made at the precise moment the shutter was pushed, either because the action would otherwise change or the particular combination of moving objects only fell into pleasant balance or meaningful relationship at that point.

3) Make a picture that could only be shot in 1976, or in the morning, or in the winter.

4) Try to do a sequence of something that's actually happening. Start taking the pictures early and stay with the action until you're sure it's completely finished.

5) Pay attention when things remind

you of memories, and take some pictures in that mood.

6) Take pictures of events—things as they are happening, or a gesture or expression. See if you can make a catalog of all the emotions you've ever felt or seen, as they are expressed by the people around you.

7) Use your camera like a diary for a day, and try to make pictures that express everything that happens to you during that day—what it feels like to wake up in your room and see whatever you see the first time you open your eyes. What does breakfast look like? What do you see every day on your way to work?

## Some fine examples of shutter's special "mark":



**Meaningful blur:** Abigail Heyman's photograph is an especially good illustration of assignment no. 1. Here the slow-shutter blur communicates not only the usual feeling of motion, but also one of fear or anxiety.



**Suspended action:** The feeling of action about to commence—the closing of the elevator door—creates a sense of tension in this photograph (above) by Alex Webb, an example of assignment no. 2.

**Changes of time:** This sequence (top) by Bernard Pierre Wolff maintains one point of view while time passes. A response to assignment no. 4, it allows us to concentrate on the interplay (or lack of it) between three strangers.



# Out, Damned Scratch! Marred Film Gets Rx

Novice darkroom workers inevitably come up against a problem that has haunted us since we stirred up our first batch of Dektol: how to get rid of scratches on precious negatives in order to yield blemish-free prints.

Crude as it might sound, a bit of nose grease has been the solution for many darkroom workers. You simply rub your proboscis with your index finger (or whatever) as if contemplating a deep thought, then apply the residual excretion to the base side of the negative around the area of the scratch. The substance fills in the scratch and can barely be detected, even when holding the negative up to light.

When we discussed this with professional photographer James Karales, he agreed with us about the nose method, but expressed some concern that acids from the skin might affect negatives over a period of time. You can always wipe the negatives clean or bathe them in a wash after printing is completed, of course. Karales suggested one alternative: Vaseline petroleum jelly, probably a milder substance than nose grease. The trick with Vaseline, however, is that it must be applied very sparingly or it might diffuse the final print. That's what *Life* magazine's photo lab used for years, Karales told us, and if it was good enough for *Life*...

Eliminating scratches, fingerprints and other blemishes from color transparencies poses a more delicate problem. For this one, we turned to Berkey K&L Custom Services in New York City, one of the largest custom color printing houses in the world.

Fred Nathan, a K&L technician in this field, stated flatly: "When you've got a scratch right through the emulsion, there's little you can do about it outside



Scratch removers? Find them at your local photo outlet... or hardware store.

of retouching the final print."

The more common scratches that occasionally crop up on the base of negatives or transparencies can be effectively remedied, however. Although K&L technicians sometimes use an oil carrier while printing, there are more immediate and practical ways for you to handle this dilemma if you're working at home. One choice is Edwal's Permafilm, a preservative solvent that can be purchased in photo stores. Wet a clean cotton cloth with this fluid, apply it to your transparencies, black-and-white negatives or movie film, and you've effectively placed an overall protective coating on the film. The solvent will evaporate quickly, but its preserving qualities remain.

Other commercial solutions are No Scratch and Tetenal's Repolisan, which are intended for use when scratches must be removed from film prior to printing.

The instructions for Repolisan, which is made at Tetenal-Photowerk in West Germany, are refreshingly honest and exact: "To work with Repolisan requires a certain amount of skill. To avoid disappointment one should practice first on short pieces of waste film. The varying composition of the emulsion base of different films will also make a test advisable to determine whether Repolisan may safely be applied to a particular film. We should not advise the use of Repolisan in conditions of high humidity, as moisture deposits may easily cause a 'white fog.'"

We followed their instructions exactly, cleaning our film first (with a store-bought film cleaner), allowing it to dry, and passing our strips of film across a small, shallow dish filled with Repolisan. We then hung our film strips up to dry. Guess what? The minor scratches and abrasions on the original film were gone when our prints were made. We also noticed that Repolisan puts a very tough coating on film, as if sealing it in plastic.

Is that the last word on scratches and other nasties? Heck, no! Longtime wed-

ding photographer Ira Itzkowitz, now associated with Olden Camera's industrial camera department, has been fighting dirt for years. Itzkowitz has had success in cleaning blemishes on negatives with plain old refined turpentine. "Swab a little on negatives with sterile cotton balls. It does the job quite nicely." What else? "How about benzine with silicone? A little on a piece of soft felt goes a long way. But don't soak it. Just pull the negative through a folded piece of felt." Some people may be turned off by the strong fumes these solutions emit. If that's the case, another answer might be to use one of the most common, easily accessible liquids known to man: denatured alcohol.

Itzkowitz's method: "Put a little on sterile cotton and coat the area in question. This stuff dries almost immediately, but is effective in cleaning negatives, slides and prints. Make sure it's denatured alcohol. Isopropyl (rubbing alcohol) could ruin your originals, so stay away from it."

## Fear of Mailing?

When shipping out those precious photos through the sometimes quirky postal system, the only way to go is first class. It's faster and more reliable than fourth class (Parcel Post) and delivers as quickly as (or quicker than) air mail, which the U.S. Postal Service is phasing out anyway.

There are two restrictions in first class: a package must not exceed 70 lb. in weight or a maximum size of 100 in. in length and girth (e.g., a package measuring 40 x 20 x 10 in. would have a length of 40 in., a girth of 60 in., and a size of 100 in.). To make sure your package gets the service it deserves, stamp or write



Lint-free cotton, best for cleaning.



"First Class" on all sides. As with other types of mail, postage is determined by the package's weight.

What if you're sending something irreplaceable or valuable (original transparencies, for instance)? Then you'll want to consider registered mail, which simply means paying a fee in addition to the first-class rate and declaring the value of your package's contents. The package then gets careful handling and is insured for up to \$10,000 (domestic mail only). Don't ask for insured mail, which is available only for parcel-post mail and only covers packages valued at up to \$200, or for certified mail, which carries no insurance.

If what you're mailing isn't irreplaceable—prints, for example—but you're worried about bent corners and the like, ask for "Special Handling." For a fee, your package is then kept out of the sacks into which most mail is perfunctorily dropped. If you're in an extra rush, pay for special-delivery service.

If you need further details about Postal Service practices, get a copy of "A Consumer's Guide to Postal Services and Products" at your post office or by writing to: The Consumer Advocate, U.S. Postal Service, Washington, D.C.

## Safest Ways To Pack Your Photos

Whether you're sending off your prize photos to a magazine or contest for consideration, or finally delivering prints of a family wedding to assorted relatives, you of course want to be certain that they arrive safely. No matter what your opinion of the U.S. mails, it can be done, but it's often up to you.

Here at MODERN we get hundreds of packages a week filled with prints and slides, so we've come to know what's best as a result of the disastrous mistakes of some readers. To help put an end to such disasters, we offer this advice:

We get lots of thin white envelopes with nothing inside but a single-weight print, and on the outside some optimist has written: "Photograph: Do Not Bend"—which would be fine if the postal service could constantly obey your wishes. It can't. If you don't want your photos bent, folded or mutilated, pack them so they can't be. This means using heavy, corrugated cardboard (shirt-laundry cardboard won't do) on each side of the pictures. To prevent frayed edges, cut the sheets slightly larger than the print size all around, add rubber bands to keep them in place, and use an envelope only slightly bigger than the final card-



Yecch! No way to pack precious photos.



Ahhh! Better with cardboard protector.



Voilà! Best is above method in "Jiffy Bag" plus return, self-addressed envelope.

board sandwich to keep it compact.

A common example: for 8 x 10-in. prints, use two pieces of 9 x 12-in. board and a 9½ x 12½-in. manila envelope. For the sake of the receiving party's sanity, make sure the cardboard package slides easily into and out of the envelope. (This goes for the return envelope too, if you include one—nothing irks us so much as 8½ x 11-in. boards sent with an 8 x 10-in. return envelope.)

What kind of envelope to use? An ordinary manila envelope will do. If you use cardboard on both sides of the prints as recommended, you don't have to

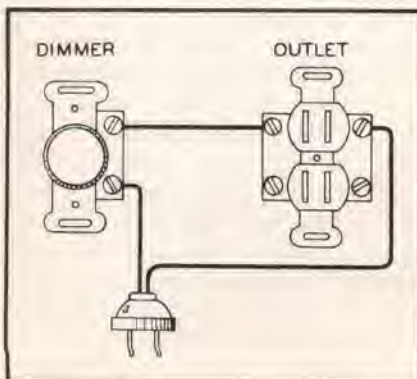
worry about the metal fastener causing any scratches. So-called "photo mailers" with string fasteners instead of metal ones are okay too, although you're paying more for not much more protection.

The best envelopes to use, because they're padded, are "Jiffy Bags," made in a wide variety of sizes and available through stationery or office-supply stores. To send slides, use either plastic "view sheets" or the original slide box you received from the processor. With the former, pack your slides as if they were prints; if you send a slide box, pad it a bit or use a tried-and-true Jiffy Bag.

## Use Dimmer To Control Floods



Don't have an expensive, variable transformer to control voltage (and thus brightness) of incandescent photo-floods? Then try a solid-state light dimmer for under \$6. You can purchase one at electrical appliance outlets or stop into your local Radio Shack and ask for their two-outlet dimmer No. 61-2699. Make sure your lamps don't exceed the rated wattage of the dimmer. And remember: the color temperature of incandescent lamps changes with the applied voltage. A 600-watt-maximum-capacity dimmer is just right for two 250-watt photo-floods.—JOHN W. MCCORMICK (Los Angeles, Calif.)





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Send Your Best Shots  
To MODERN. WIN \$35!

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## monthly contest

THIS MONTH'S SUBJECTS range from the sacred and personal to the profane and mundane. And, by some strange quirk of fate, each one was taken with a different focal length lens, each lens doing a job for which it is particularly well-suited. But this is not a lesson in when to use which lens. If there is any lesson here, it's that a good photographic subject is in the eye of the photographer and can be found just about anywhere. As you read on, you'll see that a little imagination in the darkroom comes in handy too.

The rules for "Monthly Contest" are simple. No entry blanks are needed. There is no set subject; winners are chosen entirely on their individual merits, being grouped for publication later. Enter as few or as many black-and-white prints as you like, provided: 1) they're unmounted and 4 x 5 in. or larger (except Polaroid prints, which may be original size), and 2) your name, address and full technical data appear on the back of every print. Unused photos will not be returned unless you enclose a *stamped, self-addressed envelope of suitable size*. Send entries to Contest Editor, MODERN PHOTOGRAPHY, 130 East 59th St., New York, N.Y. 10022.







**Total view:** The surrealistic, all encompassing view of a fisheye (6mm f/2.8 Nikkor) lens led Dennis Darmek into making this dramatic shot of a friend on the beach. To further strengthen the distorted, forward-thrusting central image, he literally thrust himself into the scene after releasing the self-timer on his Nikkormat. Kodak Panatomic-X, f/8, 1/60 sec.

**Wide view:** Roger Buchanan wisely chose a 24mm lens to record this seaside pier backlit by a late afternoon sun. Thus the steps in the foreground receive the most attention and benefit most from the lens's "stretching" effect. Stand-up, silhouetted trees provide a necessary counterpoint. To add a little action and fill in the upper void, Buchanan double-printed, adding the sea gull. Nikon FTN, Kodak Tri-X Pan, f/11, 1/500 sec.

**Long view:** An 85mm lens makes the perfect portrait lens, but a little imagination on the photographer's part can help to perfect the portrait. After arranging his subject's hair into a sweeping curve around her face, Douglas Mellor shot her off-center to avoid the head-on cliché view. Sidelighting, via electronic flash, created an interesting tonal pattern. Tri-X Pan in Nikon F2 with 85mm f/1.8 Nikkor lens at f/11.

**Normal view:** The lens, a 50mm f/1.7 Rikenon, may have been normal, but the subject, a toilet bowl, is not one of your run-of-the-mill pictorial subjects. Nevertheless, Victor Pytko was attracted to the pattern created by the alternating narrow bands of light and shadow cast by a louvered window shutter. The lone horizontal band and the continuation of vertical bands on the rug in the lower right corner complete the design. Ricoh TLS, Tri-X Pan, f/5.6, 1/30 sec.





# modern tests

newest cameras, lenses & important accessories

## Now Much More Info And Easier to Read

Our "Modern Tests" pages are looking a bit different, aren't they? Starting with this month we're including new graphic ways of reporting results from our lab tests. At a glance you can see just how each lens and camera did and compare this directly with our minimum standards for the equipment. While we have resorted to much abbreviation which we think will be easily understood by most of you, we have set down all the specifics directly following our tests. You may want to refer to this in the future since we will continue to chart our lab results as you see here. (The method by which we were finally able to report on light falloff in lenses is the subject of a whole story this month—"How Much Lens Light Falloff Is Too Much?" on pages 88-93.) But depend on it: We've just gotten started simplifying tests for you. We live in a world of visual communications, and we'll be communicating more visually. Therefore, from now on, shutter speeds, exposure-system accuracy and light falloff will appear in graphic form.

But the heart of a camera or lens cannot be contained in mere figures or lines drawn on a graph. The true measure of a camera or optical cake is in the eating thereof. How well did a camera or lens actually do in field tests when used by photographers? Why did the pictures produced look like? We have always felt, and will continue to believe, that the answers to these questions are at least as important as lab tests, and maybe even more so. Therefore, the charts and figures cannot tell you the whole story. Imbedded in our Modern Tests text is the lifeblood of our report—what the lens did in the hands of our field testers. Don't miss it! The combination of both field and lab tests will give you the total picture. And if a piece of equipment barely skims by a lab test of misses by a hair, though it performed excellently in the field, we're going to go along with it but let you know.

## NIKON UPDATES NIKKORMAT TO THE FT2

**MANUFACTURER'S SPECIFICATIONS:** Nikkormat FT2 35mm eye-level single-lens reflex camera. Body No. 5060331. LENS: 50mm f/1.4 or f/2 Nikkor in interchangeable bayonet mount, stops to f/16, focusing to 18 in. (0.45m), accepts 52mm accessories. SHUTTER: Metal-bladed Copal Square S focal-plane with speeds from 1 to 1/1000 sec. plus B, MX and FP sync. VIEWING: Fixed eye-level prism with central split-image rangefinder, micropism viewfinder and full focusing screen. FEATURES: Two CdS cells on either side of eyepiece read center-weighted area of viewfinder screen at full aperture for films ASA 12 to 1600, shutter speeds visible in viewfinder, meter needle visible in finder and top of camera body, hot-sync shoe with safety switch, single-threaded PC terminal, mirror-lockup lever, self-timer. PRICE: \$503 with 50mm f/1.4, \$411.50 with f/2. Black body, \$10 extra.

While many camera manufacturers seem to change camera models as often as ladies once were supposed to change hats, you can't say that about Nikon. Since the first 35mm SLR, the Nikon F, was introduced in 1959, Nippon Kogaku has only produced four basic camera models: the Nikon F (just discontinued in 1975), Nikon F2 (introduced in 1971), Nikkormat EL (introduced in 1973), plus the Nikkormat which arrived in 1965. (Purists may protest that we have left out the Nikkorex F of 1962, but Nikon did not produce that camera; it was totally the product of another manufacturer. The less said about that camera the better, but let it suffice to say that Nippon Kogaku did learn a very important lesson from it—if you want something done well, do it yourself.)

This penurious attitude toward camera models doesn't imply Nikon refuses to keep up with the times. The Nikon F went through many evolutions of its metering system and the Nikkormat did the same. (Indeed a few late-model FTn's already had the new wind lever and redesigned self-timer of

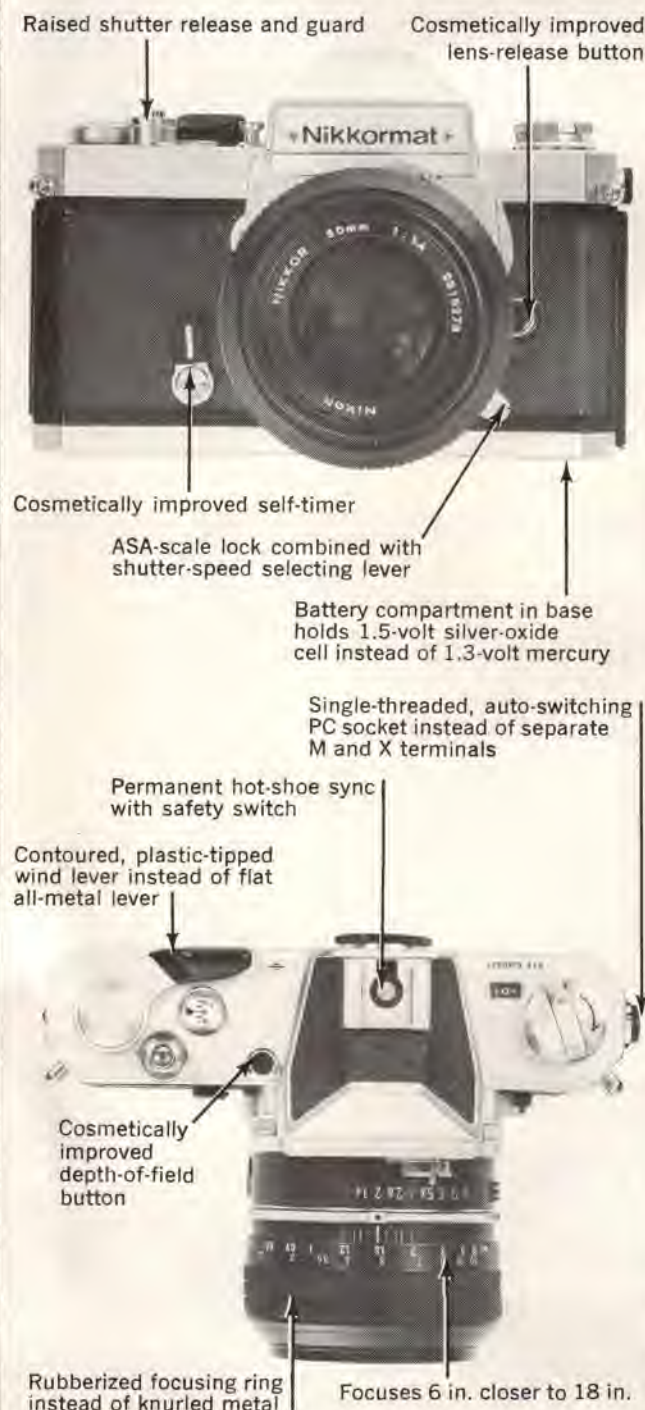
the new FT2.) But the basic camera designs were originally so sound that only upgradings and improvements were needed to keep the cameras competitive. In addition, no Nikkor lens for an SLR has ever been outmoded to the point that it couldn't be used with full convenience and automation in the latest camera body. Thus Nikon and Nikkormat owners have enjoyed, and will continue to enjoy, a guarantee against obsolescence unequalled by any other 35mm single-lens reflex camera.

We have so much taken the Nikon products for granted as

standards in the industry that, aside from noting slight changes and upgradings, we haven't tested a Nikkormat fully since the Nikkormat FTn replaced the FT in 1968! What a long-lived camera a Nikkormat model is: eight years. And the FTn is by no means an obsolete camera. It's just that the FT2 is improved in many thoughful little ways, as we'll see.

First, how can you tell a Nikkormat FT2 from a FTn? The fastest way is to look for the permanent hot shoe. If it's there, it's an FT2. Most other new features are catalogued in our "What's New At a Glance" pictures of the camera.

## Nikkormat FT2: What's New At a Glance





But we must warn you that a number of features just "officially" introduced on the FT2 actually crept into late models of the FTn, as we'll see, Nikon never "freezes" a model. It continues to improve them. What you don't see in our pictures is the new focusing screen which combines a microprism collar with a central split-image rangefinder. Thus, would-be owners need no longer agonize over whether they want one or the other. (Note: Some late-model Nikkormat FTn's have this improved screen.)

If you unlatch the camera back

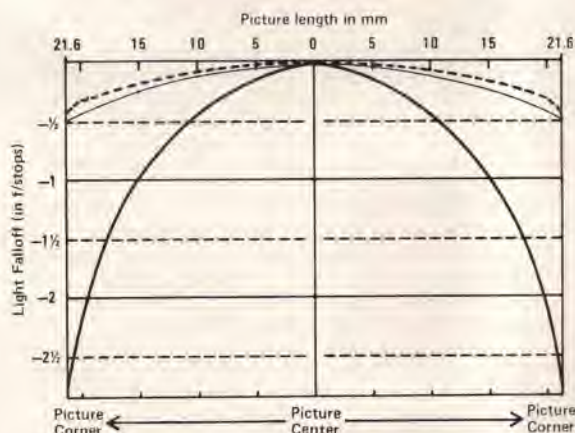
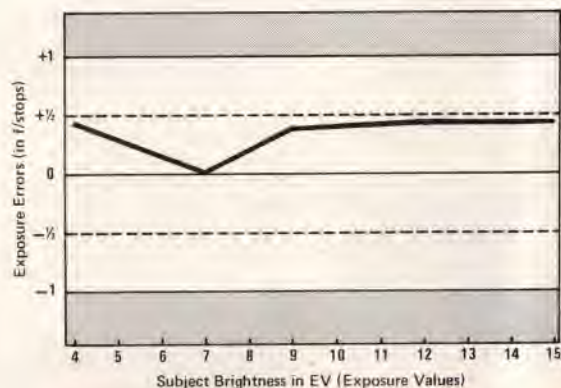
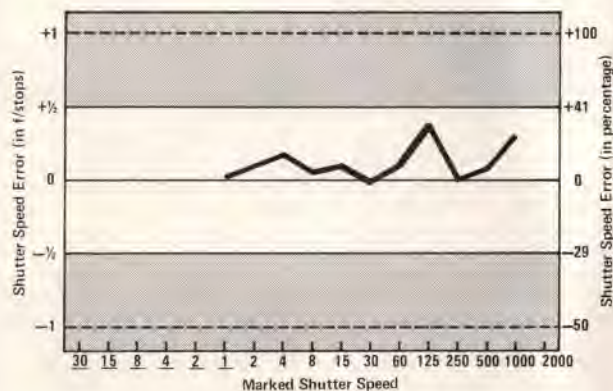
using the traditional Nikkormat side latch lever, you will note two interior changes which also made their appearance in a few late Nikkormat FTn's but which we will consider new for the purposes of this review. The FT2 has an additional roller fitted to the back to insure proper tightness of the film on the take-up spool. Secondly, various multiple-slotted take-up spool designs have been abandoned in favor of three slots. (Some years ago, we were told privately by one Nikon designer that engineers favored multiple slots but too

many users tried to feed the film into one slot and out the other.)

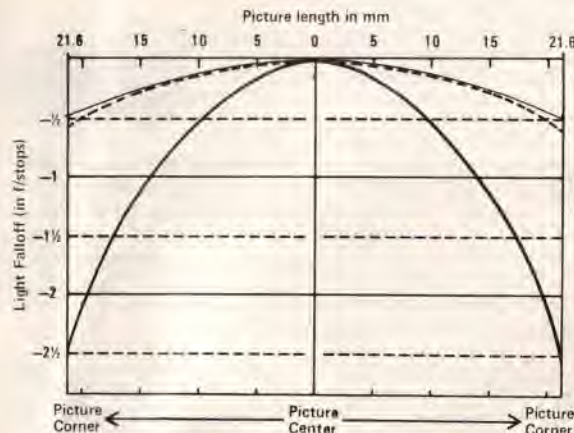
Lastly, a sharp-eyed Nikkormat expert will notice that all screws have been changed from single slotted heads to Phillips heads, which do allow greater tightness and removal without damage to the screws (again a change you will find on late FTn's as well).

Of the changes indicated in the Nikkormat FT2 photo captions, the reasons for many of them are self-explanatory, but there are a few clever surprises. The rubberized focusing ring follows the latest style of most lens makers,

but we do find its surface far more grippable than the old metal knurling. The lens formulas have not been changed, but the helicoid mount has been extended to allow the lens 6 in. of closer focusing—certainly an improvement. All chrome has now been eliminated from the lens barrel save the narrow aperture-indicator dot ring—strictly a cosmetic change. Overall, the lenses do look better, but they have lost something—information. Previously, all Nikkor lenses bore letters on their front rings indicating the number of elements used and



| GENERAL PERFORMANCE                  |                                                                                                     |                                          |
|--------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------|
| Check Points                         | Our Standard                                                                                        | As Tested                                |
| <b>FINDER:</b>                       |                                                                                                     |                                          |
| Apparent viewing distance            | Inf. to 20 in. (0.5m)                                                                               | 40 in. (1m)                              |
| Apparent distance of meter indicator | 79 in. to 20 in.                                                                                    | 20 in. (0.5m)                            |
| View area compared to film area      | More than 90%, less than 100%                                                                       | Vertical: 90%<br>Horizontal: 90%         |
| Parallax error compared to film      | Vertical: 1.2mm<br>Horizontal: 1.8mm                                                                | 0.00mm vertically<br>0.25mm towards left |
| Focusing accuracy                    | Within depth of focus                                                                               | One depth of focus toward camera         |
| Image magnification                  | 0.76X                                                                                               | 0.78X                                    |
| <b>PICTURE SIZE:</b>                 |                                                                                                     |                                          |
|                                      | 24 ± 0.6mm x 36 ± 0.9mm                                                                             | 24.0 x 35.9mm                            |
| <b>SHUTTER:</b>                      |                                                                                                     |                                          |
| Curtain travel evenness              | ± 1/4 stop                                                                                          | + 1/14 stop                              |
| Body insulation from synchronizer    | More than 7 megohms                                                                                 | Infinity                                 |
| Sync contact efficiency              | More than 60%                                                                                       | X, 75%; M, 90%                           |
| Synchronizer delay time              | X, within full opening; M, 12 to 20 ms.                                                             | X, O.K.; M, 19ms.                        |
| Shutter-curtain bounce               | Not allowed                                                                                         | O.K.                                     |
| Self-timer delay time                | 6 to 14 sec.                                                                                        | 9 sec.                                   |
| <b>LENS:</b>                         |                                                                                                     |                                          |
| Focal length                         | ± 5%                                                                                                | 50mm f/1.4, 51.3mm;<br>50mm f/2, 51.6mm  |
| Maximum aperture                     | 50mm f/1.4, f/1.42; 50mm f/2, f/2.00                                                                |                                          |
| <b>CAMERA SIZE:</b>                  |                                                                                                     |                                          |
|                                      | With 50mm f/1.4, 5 13/16 in. wide, 3 13/16 in. high, 3 3/8 in. deep; with 50mm f/2, 3 3/8 in. deep. |                                          |
| <b>WEIGHT:</b>                       |                                                                                                     |                                          |
|                                      | With 50mm f/1.4, 2 lb. 6 1/4 oz.; with 50mm f/2, 2 lb. 3 oz.                                        |                                          |





# modern tests

whether the lens was multicoated or not. While all normal lenses will now be multicoated, you can no longer check the number of elements. Why the elimination of this information? We think we know the answer. In Japan today, modern optical designs and better optical glass have allowed lens designers to use fewer lens elements but produce equally good or better lenses. This has been taking place for some time in the products of other lens manufacturers. The new lenses are usually lighter. Costs to the user can be kept minimal because of the manufacturing simplification. However, Japanese merchandisers have worried that users might think lenses with fewer elements are inferior. It may well be that Nippon Kogaku has reduced the number of elements in some of their lenses but doesn't want to risk the unfounded outraged verbal slings and arrows of owners.



**Good-bye, information:** Older f/2 (right) has H, indicating six elements; C means lens is multicoated. New f/2 (left) has no such information for lens configurations or coatings.

Turning now to the ASA setting lock, this is a big improvement since the metal indicator frame on the ASA scale of the Nikkormat FTn could be moved inadvertently. Now you must pull out a small lug from the tip of the shutter-speed setting lever before you can shift the ASA.

The flash system is now much improved with a hot-sync shoe for those who put their cordless flash right atop the camera. However, the shoe has a safety switch built in so that it becomes alive only when a flash unit is actually fitted to the shoe, thus preventing any slight electric-shock tingles on your face or nose from accidental contact with the working hot shoe during an exposure when no flash unit is attached. The single PC connection at the side of the FT2 provides the threaded locking mechanism for PC cords which are now starting to appear with threads. The single contact makes mixups between the M and X sync terminals impossible. The one contact is served by an internal switching mechanism

which shifts flash sync according to the speed selected.

Admittedly a slight amount of flexibility has been lost. The FTn permitted a wider range of flash-bulb synchronization, as you can see from a comparison of the flash-sync possibilities of the cameras in the chart below. Bulb synchronization at 1/60 and 1/125 sec. has now been lost, but it's questionable how many photographers today ever use bulbs at such speeds.



**Longer but better:** New f/2 (left) extends slightly farther because it focuses closer than old one (right). Note improved cosmetics and knurlings.

We should warn users of non-hot-shoe flash units who do intend to attach them to the hot shoe that the units may inadvertently fire if they have a charge when sliding into the shoe. However, if this is a bother, they can simply place a small piece of electrical or even cellophane tape over the sync contact. (This would be an exceptional case with modern flash units, which all seem to be made today with hot-shoe contacts.) It is this magazine's opinion that all SLR hot-shoe attachments should be confined to small, light units, and that heavier ones, which might damage the shoe or prism housing to which the shoe is fastened, should not be used in the shoes but should be side-mounted with a sturdy bracket.

| Shutter Speed | 1000 | 500 | 250 | 125 | 60 | 30 |
|---------------|------|-----|-----|-----|----|----|
| Flashbulb     |      |     |     |     |    |    |
| M             |      |     |     |     |    |    |
| FP            |      |     |     |     |    |    |
| MF            |      |     |     |     |    |    |
| X             |      |     |     |     |    |    |

Syncronized Cannot be used

| Shutter Speed | 1000 | 500 | 250 | 125 | 60 | 30 |
|---------------|------|-----|-----|-----|----|----|
| Flashbulb     |      |     |     |     |    |    |
| M             |      |     |     |     |    |    |
| FP            |      |     |     |     |    |    |
| MF            |      |     |     |     |    |    |
| X             |      |     |     |     |    |    |

Syncronized Cannot be used

**Something gained, something lost:** FT2's single-connection, auto-switching flash is more convenient than FTn two-poster, but bulb sync at 1/60, 1/125 sec. has been lost. (FT2 sync chart at top; FTn at bottom.)

Coming now to the other side of the camera, we find that the redesign of the depth-of-field preview button (which now has a black plastic inset) is strictly cosmetic, while the redesign of the

self-timer with its very visible centrally located white stripe has an actual advantage. In dim light at a distance, subjects will be able to see the self-timer's position more easily and thus have a better idea when the shutter will fire.

Why the change from the 1.3-volt mercury to a 1.5-volt silver-oxide battery? First, the voltage is higher, an advantage to the camera manufacturer. Secondly, it will operate at lower temperatures than will a mercury battery: an advantage to users. The lowest safe range with a mercury battery is 40%, but it's 32° F with a silver-oxide battery, according to battery manufacturers. In terms of meter sensitivity, the Nikkormat FT2's range is exactly that of the FTn: EV3 to EV 17 at ASA 100.

There's nothing unusual about loading a Nikkormat FT2. It's done in the usual manner and film is advanced with the rapid-wind lever and shutter release until frame "1" appears in the largish frame counter atop the camera directly in front of the plastic tip of the rapid-wind lever. Actual numerals appear quite legibly for every other frame with plain lines in between and red numerals at the 20 and 36 exposure markings to indicate the finish of a long or short film roll.

When winding off the film leader you'll probably notice that while the wind lever throw remains the same 135° and still must be made in a single motion since it is not ratcheted, the new



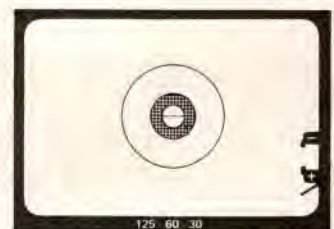
**Higher release:** Button and collar are raised for easier shooting.

contour of the lever itself, plus the plastic tip, is far more comfortable and convenient. The shutter release and collar have been elevated slightly to make them easier to reach with your first finger now that the hub of the wind lever has been raised to accommodate the new shape of the lever.

The metering system, as in all Nikkormats past and present, turns on when the lever is pulled some 20° away from the camera body, thus exposing the red "meter on" dot atop the camera body. The lever will remain in this action position until you deliberately press it back towards the body and turn off the meter. (Some left-eyed persons habitually shut off the meter by accidentally pressing the lever in with their foreheads while viewing through the finder. These folks

will obviously have to watch out for the same thing in the Nikkormat FT2.)

The new combination split-image rangefinder microprism screen was derived from the Nikon interchangeable K screen. The 3mm central-circle rangefinder provides an excellent and definite split of lines when the image is out of focus, both halves of the image being displaced in opposite directions. It is quite usable for all lenses with apertures of f/4 or larger, but we



**Two in one:** Combined rangefinder with microprism collar is now standard in all non-auto Nikkormats.

could also use it at f/5.6. Of course, at f/5.6 your eye must be located directly behind the center of the rangefinder or one or the other of the rangefinder hemispheres is likely to appear dark. The narrow 1mm outer microprism ring works best over the same aperture range. We wish this ring were broader for smaller-aperture lenses—when viewing at shooting aperture using bellows for large magnifications, or when attaching the camera to microscopes or telescopes, or for general applications, the more ample, fine-focusing outer area should be used. Although a fine-focusing collar is inscribed on the focusing screen, we found the entire area inside and out to be sufficiently fine for very accurate focusing. But this outer ring proved more useful as a general indication of the major center-weighting for the through-lens metering system.

While screen brightness has never been outstanding in Nikkormats, it is adequate; and what it might lack in brightness, it makes up for in fine contrast. Eyeglass wearers will be able to see the entire picture frame area including the meter needle at the right. The shutter speed set appears, as in the Nikkormat FTn, at the bottom and outside of the picture area, in white with the next highest and lowest speeds in yellow. Brightness of the shutter-speed indications depends on illumination through the lens. When the camera is photographing a bright area or is in good light, the shutter speeds are easy to see. In poor light they can become difficult, although the heavy black meter needle and its "+" and "-" limiting arms still remain quite visible. The image through the finder with a 50mm



lens reveals an image slightly smaller than life-size. (Other finder vs. film-format measurements and analyses which used to appear in text form are now included in our charts, where we feel they will be easier for all of us to assimilate).

We have always been impressed with the alacrity of meter-needle movement in Nikkormats. Despite the fact that the FT2 (like its predecessors) uses two CdS cells to read the focusing screen, rather than the newer silicon-cell circuits that provide faster response time, the CdS system would be hard to improve in speed; it provides very fast meter centering even under lighting conditions like those requiring 1 sec. at f/1.4. However, like all CdS cells, care should be taken not to point the cell at a brilliant light source prior to using it at a lower light level, since such a change does require some meter rest time to allow the CdS cells to "forget" the bright light and give proper readings.



**Center-weighting continues: Nikon was first with this type of metering and FT2 continues the practice along with other Nikons.**

The old argument of whether a center-weighted, spot or averaging meter is best hardly seems pertinent today with more and more camera brands adopting what Nikon had first—the center-weighted system with approximately 60 percent of its weighting within the outer scribed circle. We have charted the actual sensitivity of the meter pattern for you, however, and the meter's total range and accuracy now appear in chart form and can readily be compared to our allowed tolerances.

Before we leave the metering system, note should be made of a distinct plus and a possible minus. To the good is the secondary meter needle, which appears atop the camera body

housing near the rewind knob. This allows you to set the proper exposure without moving the camera to eye level. For candid shooting this is a great boon since you can actually face in one direction while making a reading in another. It is likewise a great assist if you're using a right-angle finder on the Nikkormat and the needle within the finder becomes partially or totally obscured.

On the minus side is the need to index each lens for maximum-aperture setting when lenses are changed. But is this truly an



**Good feature: Nikkormats provide meter needle at top in addition to needle in finder.**

obstacle? Granted that you must match up the meter-coupling pin on the camera body with the meter-coupling prong at the f/5.6 aperture mark on the lens, then attach the lens, twist the aperture ring to full aperture and check the aperture-indexing scale to make certain the red dot is at the maximum-aperture marking. But this system does allow Nikon and Nikkormat owners to use lenses or camera bodies of any sort ever made since the original Nikon of 1959, while other camera makers have obsoleted bodies and/or lenses twice and even three times during the same period. It's an old quarrel, and no doubt Nikon will someday provide an attaching system that does not need such a complex keying system for the meter. However, it's felt that, even then, the new system must be 100 percent compatible with older cameras and lenses which have aperture keying prongs.

We do have a recommendation for easier lens keying. While many photographers (both amateurs and professionals) have developed their own most convenient system, we find that we get fastest and most consistently cor-

rect results by moving the connecting pin to the far right as the lens-less body faces you. Set the lens to be fitted at f/5.6. Connect the body and lens. While holding the aperture-setting ring and chrome ring together, twist the lens to left until it clicks into the locked position. Now twist the aperture ring to the smallest aperture and then reverse it to a larger aperture. The lens will index properly each time. Soon you will be able to do it by sound. The loud click of the lens being seated and the meter mechanism snapping to the f/5.6 index, followed by the ratcheted noise of the mechanics moving the index to full aperture, will tell your ears that the indexing is correct.

Nikkormat owners will find it beneficial to practice indexing all lenses they buy before they take them on a field trip so that indexing becomes second nature. While removing lenses by pressing the large convenient lens-release button and twisting the lens clockwise, don't forget to set the lens aperture to f/5.6 or smaller or you may have some difficulty removing the lens. The mirror-lockup lever can be useful if you intend to do any work with microscopes, telescopes or other specialized apparatus where you wish to eliminate as much mechanical vibration as possible. You view and focus, then lock away the mirror. The lock lever works in the opposite direction from the mirror travel: you pull the lever down to raise the mirror back (on our sample Nikkormat FT2, the lock mechanism was rather stiff, but this is the first time we've ever experienced such stiffness). However, we have found a simpler alternative to the lockup lever. If you set the self-timer (8 sec. delay), the mirror will fly upwards immediately after you press the shutter release and remain upwards until the shutter has closed. You can thus use the self-timer to flip the mirror out of the way prior to making a precise technical picture, since the 8-sec. delay is plenty of time for the camera to settle down for the exposure. Afterwards, the mirror automatically returns for viewing so you needn't flip the mirror lock. However, we would like to see Nikon adopt a self-timer whose mechanism can be cancelled, once set, in case you decide against using it. On Nikkormats, once the self-timer is set the shutter can only be released after the self-timing interval.

In terms of construction, the word for the Nikkormat is rugged. Mechanical and electrical problems which plagued earlier Nikkormats—eyepiece finders that popped out, meter-battery connections that fouled up, frame-counter windows that came off, shutter-winding mechanisms that weren't secure at the end of their travel—have long since been ironed out, as Nikon has had more experience (in time and

Would you like to test your own lens? Get MODERN's Lens Test Kit, \$4.50. Write to Lens Test Kit, MODERN PHOTOGRAPHY, 2160 Patterson Street, Cincinnati, Ohio 45214.



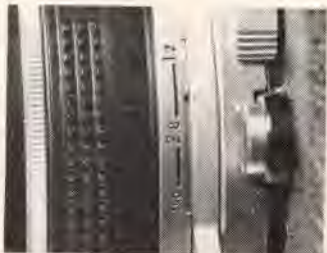
**Indexing lens aperture 1: With pin to far right, lens must be set at f/5.6.**



**Indexing aperture 2: Insert lens, twist counterclockwise, turn aperture to smallest opening.**



**Indexing aperture 3: Twist lens aperture to full opening, listen for ratchetting sound.**



**Indexing aperture 4: Check indexing scale to see that red dot is properly set.**

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# modern tests

numbers) perfecting the Nikkormat design than any other camera manufacturer with a presently available model.

Why a metal-blade shutter in the Nikkormat and a titanium-foil-blind shutter in the Nikon? Doesn't this mean the Nikkormat's inferior? No. It's a question of camera use. The metal-blade shutter provides better flash synchronization, is less expensive to make, and can be inserted into a camera far more easily than the titanium-foil shutter. But the titanium-foil shutter can operate at five frames per sec. for shooting with the Nikon's motor, which the Copal Square cannot.

True, the Nikon's shutter is supposed to be longer-lasting in terms of total exposures, but again we're talking about vast quantities of meter-drive exposures, which the Nikkormat will never contend with.



**Noncancelable timer:** Once set, it cannot be overridden.

In constructional terms the Nikkormat is comparable today to the Nikon. In chrome finish or black paint they are equal. Only in the soft contours of the camera-body edges and the finer pebble-grain body covering does the far more expensive Nikon F2 seem to hold an edge.

The Nikkormat FT2 really comes into its own when put to the real test—actual use. Most users find that the size and shape, plus the positioning of the controls, "feel right." We find such reports uncomfortably subjective for a scientific analysis of a camera. But such is the summation of many Nikkormat users who tried the camera in the field. Only one camera control gave any trouble. The shutter-speed setting lever with the shutter speeds around the lens mount seemed mysterious to Nikkormat newcomers. However, after familiarization, everyone got the hang of it and never became confused (unless they were trying to handle both a Nikon and Nikkormat at the same time, in which case they had to stop and think where the controls were on each one).

Users quickly discovered the

reason for the color coding of the shutter-speed scale (black to 1/125 sec., red onwards to 1/1000 sec.). Red means it's O.K. for electronic flash and black means it's a no-no. You can see the scale coloration difference in poor light even when you can't read the numerals precisely. (Our shutter-speed accuracy tests run in the lab appear in chart form on page 00.) Shutter noise was average, typical for the Copal Square. Vibration was average for a camera of this construction.



**Better-wound film:** Back roller keeps film snug on spool.

It would be foolish to say that the Nikkormat FT2 is equal, feature-wise, to all other SLR's in its price class. It isn't. There are no silicon cells in the metering circuit, no apertures visible in the finder. There are brighter finders, smaller camera bodies and quieter shutters. But the FT2 has the essentials and more, now updated in a camera which, in earlier models, was already proven. It's part of the world's largest camera system, which is fully integrated and never obsolete. It's a camera from the school of hard knocks, and it can take the gaff whether you're a beginning amateur or a professional looking for a tool that will stand a real kicking around. And if you don't need the Nikon's motors, bulk film backs, changeable screens, finders, and the name's prestige, why go further?



**Big improvement:** ASA lock must be pulled for index change to prevent an error in setting.

Now let's see how the two lenses tested, the 50mm f/1.4 and f/2, behaved. They are modified Gauss types of seven and six elements respectively, whose formula remains much the same as when they first appeared many years ago (although, of course, both lenses are now multi-

coated). Here's what we discovered in our tests of the lenses:

Starting with the 50mm f/1.4, we tried to find the significant optical differences (if any) between these new lenses and the older, conventional Nikkors. Obviously, the newer lenses had closer minimum-focusing distances, and amazingly, we found that image quality at these closer distances was substantially improved in the later Nikkors. For example, the new 50mm f/1.4 exhibited very sharp images with good contrast at 1.5 ft. (0.45m). The new seven-bladed (as opposed to the older six-bladed) diaphragm is also at least partially responsible for improved out-of-focus image quality and reduced double-line effects. Astigmatic streaking was very low even at maximum aperture, though we did record a very slight increase in linear distortion. The following observations of the 50mm f/1.4 were made at normal focusing distances:

**Central image quality:** A normal amount of red spherochromatic color fringing was observed wide open on the optical bench and in our test transparencies, but it disappeared completely at f/5.6 and smaller apertures. Focus shift was very small. Decentering was observable on the bench, but was not noticeable in pictures.

**Edge image quality:** A normal amount of lateral color fringing for a wide-aperture lens was observable on the optical bench, but this type of color fringing was barely visible in our pictures. A fairly strong inward coma was noticeable in the corners of the picture field at f/1.4, but it disappeared at f/4 and smaller apertures. Astigmatism was virtually absent throughout.

**Residual ghosts and flare:** Low-

intensity bluish ghosts were present at very critical angles, but compared with its predecessor, this lens unquestionably represents a remarkable improvement.

Now let's turn to the latest 50mm f/2 Nikkor. Its image quality at the closest focusing distance (1.5 ft., or 0.45m) was even better than exhibited by the new-formula f/1.4! Crisp sharp images at the plane of focus and smooth, streakless out-of-focus images made for truly fine field-test pictures.

**Central image quality:** Virtually no trace of color fringing was observable even wide open. Spherical flare was slightly more pronounced at f/2 (compared with the 50mm Nikkor), but it quickly disappeared when the lens was stopped down to f/2.8. From that point down to the smallest aperture (f/16), the image was almost a perfect star-image point on the bench. Our field-test pictures bore out the excellent results obtained in our laboratory analysis. Decentering was absent.

**Edge image quality:** An extremely low level of lateral color fringing was observed on the bench and there was none at all in the pictures. Skew-ray flare was noticeable at maximum aperture both on the bench and in the pictures. However, it disappeared by f/4 in the pictures and by f/5.6 on the bench. Slight astigmatic streaking was observable on the bench but not in the pictures.

**Residual ghosts and flare:** At extremely critical shooting angles we discovered some low-intensity bluish ghosts and slightly yellowish flare, but neither of these phenomena was pronounced enough to constitute a genuine defect.—THE END

## Resolution Power

| 50mm f/1.4 Nikkor<br>No. 2815273<br>At 1:48 Magnification |                    |                    |  |  |
|-----------------------------------------------------------|--------------------|--------------------|--|--|
| f/no.                                                     | Center<br>Lines/mm | Corner<br>Lines/mm |  |  |
| 1.4                                                       | Good 43            | Exc. 38            |  |  |
| 2                                                         | V/Good 54          | V/Good 43          |  |  |
| 2.8                                                       | Good 61            | Good 48            |  |  |
| 4                                                         | Good 61            | V/Good 54          |  |  |
| 5.6                                                       | Good 61            | V/Good 54          |  |  |
| 8                                                         | Good 61            | V/Good 61          |  |  |
| 11                                                        | V/Good 61          | Exc. 54            |  |  |
| 16                                                        | V/Good 61          | V/Good 48          |  |  |

## Image Contrast

| 50mm f/1.4 Nikkor<br>No. 2815273<br>At 30 lines/mm |                      |                      |  |  |
|----------------------------------------------------|----------------------|----------------------|--|--|
| f/no.                                              | Center<br>Percentage | Corner<br>Percentage |  |  |
| 1.4                                                | Medium 46            | Low 24               |  |  |
| 2                                                  | Low 48               | Low 24               |  |  |
| 2.8                                                | Low 64               | Low 30               |  |  |
| 4                                                  | Low 65               | Medium 48            |  |  |
| 5.6                                                | Low 68               | High 57              |  |  |
| 8                                                  | Low 68               | High 56              |  |  |
| 11                                                 | Medium 64            | High 56              |  |  |
| 16                                                 | Medium 62            | High 50              |  |  |

## Resolution Power

| 50mm f/2 Nikkor<br>No. 3158314<br>At 1:48 Magnification |                    |                    |  |  |
|---------------------------------------------------------|--------------------|--------------------|--|--|
| f/no.                                                   | Center<br>Lines/mm | Corner<br>Lines/mm |  |  |
| 2                                                       | Accept. 43         | Exc. 43            |  |  |
| 2.8                                                     | Accept. 43         | Good 43            |  |  |
| 4                                                       | Accept. 48         | Good 48            |  |  |
| 5.6                                                     | Accept. 54         | Good 48            |  |  |
| 8                                                       | Accept. 48         | V/Good 54          |  |  |
| 11                                                      | V/Good 61          | Exc. 54            |  |  |
| 16                                                      | Good 54            | Exc. 48            |  |  |

## Image Contrast

| 50mm f/2 Nikkor<br>No. 3158314<br>At 30 lines/mm |                      |                      |  |  |
|--------------------------------------------------|----------------------|----------------------|--|--|
| f/no.                                            | Center<br>Percentage | Corner<br>Percentage |  |  |
| 2                                                | Low 42               | Low 25               |  |  |
| 2.8                                              | Low 58               | Low 30               |  |  |
| 4                                                | Low 66               | Low 44               |  |  |
| 5.6                                              | Medium 70            | Medium 56            |  |  |
| 8                                                | Low 66               | Medium 56            |  |  |
| 11                                               | High 64              | High 52              |  |  |
| 16                                               | High 54              | Medium 42            |  |  |



## MODERN's test standards and how some have been evolved.

**Shutter-speed accuracy:** Based on many years' tests of color-slide film latitude, we have set the total exposure accuracy limit at the film plane to one f/stop. Within this error, adequate exposure of color film should be achieved. Each separate exposure control—shutter speed, lens f/number and meter—must be in error by no more than 1/2 f/stop. You might wonder why we didn't make it 1/3 f/stop so all three would add up to a total error of one f/stop.

The reason? These three factors rarely go totally wrong in one direction at the same time. Therefore, an individual requirement of  $\pm 1/2$  f/stop for each control is more realistic for the needs and achievable tolerances by engineers.

**Light falloff:** We have decided not to place a limitation now on full-aperture light falloff since there are many factors which contribute to this fault (see pages 88 to 93).

Certainly, with extreme wide-angle lenses, high-speed lenses and mirror tele optics, there must be more forgiveness. However, we will offer some criticism of most lenses which show more than a one-stop illumination falloff from the center to the edges and corners when closed down to f/5.6. (When lenses have a maximum aperture of f/5.6 or smaller, we will give additional criteria and estimates at that time.)

**Apparent viewing distance:** This is usually measured in diopters (an optical term used to express eye accommodation). However, for purposes of simplification, we convert them into inches. This means, for instance, that if we say a finder image appears to be at 30 in., you will view the focusing screen or range-finder image as if it were on a plane 30 in. away from your eye. We also estimate the distances of other finder information for you. Meter needles, shutter-speed designations and apertures (if shown) should all be within a reasonable distance from the focusing screen, so that you can view the screens and other information comfortably without having to refocus your eye. Ideally, everything should be on exactly the same plane so you will have no trouble seeing it all at once. For optical and mechanical reasons, this is usually impossible, but engineers should keep the information together as close as possible. We have placed a 1/2-diopter limit on the finder indication from the focusing screen, but we'll calculate the actual distance for each camera.

**Viewing area:** Seldom in any camera does the viewfinder

show in area, exactly what the film sees. In a few cameras, such as the Nikon, every attempt is made to render the finder and picture area exactly the same, or 100 percent. However, most camera makers provide a finder area that's somewhat smaller, allowing for part of the picture area to be covered by slide mounts or enlarger negative carriers. We feel that the finder must show no less than 90 percent of the actual picture area on film in the case of single-lens reflex cameras, and 85 percent of the area in the case of rangefinder or viewfinder cameras.

**Parallax error:** While most viewfinders show less than the actual picture area, this view is seldom centered exactly within the picture-area frame. Usually there is some error to the right or left, up or down. The limit of parallax error varies depending on the finder vs. picture-area percentage. However, we feel parallax is permissible, provided the view does not extend beyond what the film can actually record. We calculate the error with each camera in millimeters, as well as the direction in which the error occurs.

**Focusing error:** When your camera is accurately focused with the aid of a focusing screen or rangefinder, there inevitably will still be some error between this point of focus in the finder and the actual point of focus on the film itself. We allow this focusing error discrepancy, provided its total falls within the actual depth of field of the lens at maximum aperture.

**Image magnification:** While there is no standard needed here, this information is most helpful to photographers. Early 35mm SLR's for instance, prided themselves on giving 1X image magnification, which meant that the image in the finder appeared to be the same size as if you were looking directly at the image with the naked eye. Today, with most cameras and normal lenses, the images are somewhat smaller. We measure this magnification by comparing finder-image size and subject size at infinity. Using a traveling microscope to help us compare photographs, we measure the actual photograph shot directly by the camera with a picture made through the finder itself.

**Picture size:** We allow a 2.5 percent error in actual vs. stated size. For instance, in a 35mm full-frame camera, 24 x 36mm would be the stated size. Any error horizontally or vertically must be within 2.5 percent of this figure.

**Shutter-travel accuracy:** With focal-plane-type shutters, we must check exposure error across the entire film plane

because the shutter curtains move all the way across the film during exposure. Therefore, there is a possibility of uneven exposure. We measure this as evenness of curtain travel, and we allow an exposure error of 1/3 f/stop through the film plane.

**Camera body insulation:** Proper insulation from the synchronization is a safety indication for the cameraman and indicates the possible danger of accidental flash-unit firing. In electrical terms, more than 7 megohms resistance between the camera body and the synchronizer contact with 500 volts will be our requirement.

**Synchronizer contact efficiency:** This insures the perfect firing of the flash unit when the camera shutter is clicked. We will require that the flash contact of the shutter be capable of passing at least 60 percent of the flash unit's energy.

**Synchronizer delay time:** This is generally expressed in the number of milliseconds (ms.) that elapse between ignition and the actual opening of the shutter. It originated with flashbulbs, since most required some delay so they could reach adequate burning brightness before the shutter operated. This delay is called M sync. We give both the manufacturer's specifications and our measurements. X sync, used mostly for electronic flash, should provide instant ignition during the time the shutter is totally opened. We indicate whether this is achieved or not.

**Self-timer:** We list manufacturer's specifications and our maximum tested time.

**Lens focal length:** A 5 percent error is allowable.

**Zoom-lens focal length ratio:** Again, a 5 percent error.

**Lens aperture f/number:** This is a sticky area. In actual exposure control, transmission should be measured in T/numbers (actual light transmitted) instead of f/numbers (theoretical light transmitted). There are many arguments pro and con, but no fixed testing conditions we can use now. In the future, whenever authoritative standards are adopted internationally, we will consider evolving a testing system in T/numbers. Meanwhile, we will report our findings on the maximum f/number of each lens.

**Camera size and weight:** A few years ago, while faithfully reporting on a camera's weight by taking the word of the manufacturer, we found that what was said to be the weight simply wasn't. We therefore resolved to do our own weighing and measuring. With camera makers competing to produce smaller and lighter cameras, we feel this information has become more vital than previously.

Here are Modern Tests' standard tables for resolution power of wide-angle lenses covering the fisheye to 44mm range. These, together with the tables already published in our previous issues and the tables which will be published in the future, are part of our total revised optical evaluation standard.

## Resolution Power

| 35MM CAMERA LENSES<br>FISHEYE 15MM |          |         |          |         |  |
|------------------------------------|----------|---------|----------|---------|--|
| Apertures                          | Center   |         | Corner   |         |  |
|                                    | Lines/mm | Rating  | Lines/mm | Rating  |  |
| Two maximum apertures              | 36.28    | Accept  | 24.26    | Accept  |  |
|                                    | 40.44    | Good    | 27.49    | Good    |  |
|                                    | 45.51    | V. Good | 30.72    | V. Good |  |
|                                    | 52.4     | Exc.    | 33.4     | Exc.    |  |
| Medium apertures                   | 40.46    | Accept  | 26.28    | Accept  |  |
|                                    | 47.57    | Good    | 29.57    | Good    |  |
|                                    | 55.59    | V. Good | 33.35    | V. Good |  |
|                                    | 63.4     | Exc.    | 36.4     | Exc.    |  |
| f/11 to smallest aperture          | 40.44    | Accept  | 25.77    | Accept  |  |
|                                    | 45.51    | Good    | 28.30    | Good    |  |
|                                    | 51.55    | V. Good | 31.33    | V. Good |  |
|                                    | 59.4     | Exc.    | 34.4     | Exc.    |  |

| 35MM CAMERA LENSES<br>17MM-23MM |          |         |          |         |  |
|---------------------------------|----------|---------|----------|---------|--|
| Apertures                       | Center   |         | Corner   |         |  |
|                                 | Lines/mm | Rating  | Lines/mm | Rating  |  |
| Two maximum apertures           | 33.27    | Accept  | 25.77    | Accept  |  |
|                                 | 41.39    | Good    | 28.4     | Good    |  |
|                                 | 50.55    | V. Good | 32.15    | V. Good |  |
|                                 | 59.4     | Exc.    | 35.4     | Exc.    |  |
| Medium apertures                | 40.46    | Accept  | 28.40    | Accept  |  |
|                                 | 48.55    | Good    | 31.33    | Good    |  |
|                                 | 56.59    | V. Good | 34.37    | V. Good |  |
|                                 | 63.4     | Exc.    | 37.4     | Exc.    |  |
| f/11 to smallest aperture       | 40.44    | Accept  | 28.30    | Accept  |  |
|                                 | 45.51    | Good    | 29.33    | Good    |  |
|                                 | 50.55    | V. Good | 32.35    | V. Good |  |
|                                 | 59.4     | Exc.    | 35.4     | Exc.    |  |

| 35MM CAMERA LENSES<br>24MM-44MM |          |         |          |         |  |
|---------------------------------|----------|---------|----------|---------|--|
| Apertures                       | Center   |         | Corner   |         |  |
|                                 | Lines/mm | Rating  | Lines/mm | Rating  |  |
| Two maximum apertures           | 33.27    | Accept  | 25.75    | Accept  |  |
|                                 | 41.29    | Good    | 29.42    | Good    |  |
|                                 | 50.55    | V. Good | 33.45    | V. Good |  |
|                                 | 59.4     | Exc.    | 36.4     | Exc.    |  |
| Medium apertures                | 40.46    | Accept  | 28.41    | Accept  |  |
|                                 | 48.56    | Good    | 31.35    | Good    |  |
|                                 | 56.59    | V. Good | 34.39    | V. Good |  |
|                                 | 63.4     | Exc.    | 37.4     | Exc.    |  |
| f/11 to smallest aperture       | 40.44    | Accept  | 28.41    | Accept  |  |
|                                 | 45.49    | Good    | 31.35    | Good    |  |
|                                 | 50.54    | V. Good | 34.39    | V. Good |  |
|                                 | 59.4     | Exc.    | 37.4     | Exc.    |  |

| 35MM CAMERA WIDE-ANGLE LENSES<br>1/2 AND FASTER |          |         |          |         |  |
|-------------------------------------------------|----------|---------|----------|---------|--|
| Apertures                                       | Center   |         | Corner   |         |  |
|                                                 | Lines/mm | Rating  | Lines/mm | Rating  |  |
| Two maximum apertures                           | 36.28    | Accept  | 24.26    | Accept  |  |
|                                                 | 40.43    | Good    | 27.30    | Good    |  |
|                                                 | 44.47    | V. Good | 31.33    | V. Good |  |
|                                                 | 52.4     | Exc.    | 34.4     | Exc.    |  |
| Medium apertures                                | 40.46    | Accept  | 26.28    | Accept  |  |
|                                                 | 47.55    | Good    | 29.32    | Good    |  |
|                                                 | 54.67    | V. Good | 32.35    | V. Good |  |
|                                                 | 61.4     | Exc.    | 35.4     | Exc.    |  |
| f/11 to smallest aperture                       | 40.44    | Accept  | 26.11    | Accept  |  |
|                                                 | 45.49    | Good    | 29.15    | Good    |  |
|                                                 | 50.55    | V. Good | 32.19    | V. Good |  |
|                                                 | 59.4     | Exc.    | 35.4     | Exc.    |  |



# Starlight

## COLOR LAB

### 35 MM COLOR RELOADS WITH PROCESSING INCLUDED

#### ANSCOCHROME & EKTACHROME

(ASA 50)

(ASA 64)

Guaranteed fresh, in-date 20 Exposure rolls with processing included. Daylight.

|          |                 |
|----------|-----------------|
| 1 Roll   | \$ 2.50 Mounted |
| 5 Rolls  | 12.25 Mounted   |
| 10 Rolls | 24.00 Mounted   |
| 20 Rolls | 48.00 Mounted   |

(These rolls can be mixed)

#### ANSCOCHROME & EKTACHROME RELOADS (Processing NOT included)

35 mm. 20-exposure Daylight or Flash.  
Guaranteed fresh, in-date.

|         |        |          |       |
|---------|--------|----------|-------|
| 1 Roll  | \$1.50 | 10 Rolls | 14.00 |
| 5 Rolls | 7.25   | 20 Rolls | 28.00 |

(These rolls can be mixed)

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

### FILM PROCESSING

(One Day Service)

#### 35 mm. Anscochrome and Ektachrome

|                        | 1 Roll     | 5 Rolls    |
|------------------------|------------|------------|
| 20 Exposure Mounted    | \$1.25 ea. | \$1.15 ea. |
| 36 Exposure Mounted    | 2.10 ea.   | 2.00 ea.   |
| 126 Mounted            | 1.25 ea.   | 1.15 ea.   |
| Stereo Mtd. (15 pairs) | 2.25 ea.   | 2.15 ea.   |
| Stereo Mtd. (28 pairs) | 4.00 ea.   | 3.90 ea.   |
| 1/2 Frame (40 Frames)  | 2.10 ea.   | 2.05 ea.   |
| 1/2 Frame (80 Frames)  | 3.50 ea.   | 3.40 ea.   |
| 120-620-127 in Sleeves | 1.25 ea.   | 1.15 ea.   |

Mounted at 40¢ per roll extra

#### 35MM, 8MM & 16MM KODACHROME PROCESSING BY EASTMAN KODAK

|                          |             |                   |             |
|--------------------------|-------------|-------------------|-------------|
| 20 Exposures             | \$2.00 Mtd. | Stereo (15 pairs) | \$3.40 Mtd. |
| 36 Exposures             | 3.40 Mtd.   | 126 Instamatic    | 2.00 Mtd.   |
| 8mm, 25' Magazine        | \$1.60      | 16mm, 100' Roll   | 5.25        |
| 8mm, 25' Roll            | 1.90        | 16mm, 100' Roll   |             |
| Super 8mm, 50' Cartridge | 1.90        | Ektachrome        | 7.00        |
| 16mm, 50' Magazine       | 2.00        |                   |             |

California residents  
add 6% tax

### COLOR SLIDE DUPLICATES

#### 35 mm. to 35 mm.

|       |              |         |              |
|-------|--------------|---------|--------------|
| 1-10  | 20c ea. mtd. | 51-100  | 15c ea. mtd. |
| 11-20 | 18c ea. mtd. | 101-500 | 14c ea. mtd. |
| 21-50 | 17c ea. mtd. | 501-up  | 13c ea. mtd. |

#### SUPER SLIDE DUPLICATES

(From Super Slides, 120, 127, 828 or 35mm)

|       |              |         |              |
|-------|--------------|---------|--------------|
| 1-10  | 25c ea. mtd. | 51-100  | 22c ea. mtd. |
| 11-20 | 24c ea. mtd. | 101-200 | 21c ea. mtd. |
| 21-50 | 23c ea. mtd. | 201-up  | 20c ea. mtd. |

#### STEREO DUPLICATES

|                     |               |         |               |
|---------------------|---------------|---------|---------------|
| 1-10                | 35c pair mtd. | 41-100  | 30c pair mtd. |
| 11-20               | 33c pair mtd. | 101-500 | 25c pair mtd. |
| 21-50               | 32c pair mtd. | 501-up  | 20c pair mtd. |
| Stereo to full 35mm |               |         | 35c each      |
| 16mm to 35mm        |               |         | 75c each      |

### COLOR FILM REDUCTIONS

2 1/4 x 2 1/4, 2 1/4 x 3 1/4 or 4 x 5 to 35mm 25c each

### 8 MM. & 16 MM. KODACHROME DUPLICATES

|                        |              |
|------------------------|--------------|
| 16mm to 16mm           |              |
| 8mm to 8mm             | 24c per foot |
| Super 8mm to Super 8mm | 20c per foot |
|                        | 20c per foot |

Minimum Order on 8mm & 16mm duplicates—\$10.00

### PRINTS From Any Half Frame 35- mm to 4x5 Transparency

|               | 1          | Any 6      | Any 12     |
|---------------|------------|------------|------------|
| 2 1/4 x 3 1/4 | \$ .25 ea. | \$ .20 ea. | \$ .18 ea. |
| 3 1/8 x 4 5/8 | .40 ea.    | .38 ea.    | .35 ea.    |
| 4 x 5         | .50 ea.    | .45 ea.    | .40 ea.    |
| 5 x 7         | .85 ea.    | .80 ea.    | .75 ea.    |
| 8 x 10        | 1.75 ea.   | 1.60 ea.   | 1.50 ea.   |
| 11 x 14       | 4.75 ea.   | 4.50 ea.   | 4.25 ea.   |
| 16 x 20       | 12.00 ea.  | 11.00 ea.  | 10.50 ea.  |

#### KODACOLOR PRINTS

From Kodacolor Negatives

|                                       |            |
|---------------------------------------|------------|
| 2 1/4 x 3 1/4 (from 35mm & 828 only)  | \$ .25 ea. |
| 3 1/2 x 3 1/2 (from square negatives) | .35 ea.    |
| 3 1/2 x 5                             | .40 ea.    |
| 5 x 7                                 | \$1.00 ea. |
| 8 x 10                                | 3.00 ea.   |
| 11 x 14                               | 6.75 ea.   |
| 5 x 5                                 | 1.00 ea.   |
| 8 x 8                                 | 3.00 ea.   |
| 11 x 11                               | 6.75 ea.   |

#### KODACOLOR PRINTS

From Positive Transparencies

| ANSCOCHROME, EKTACHROME and KODACHROME |            |         |          |
|----------------------------------------|------------|---------|----------|
| 2 1/4 x 3 1/4 (from 35mm & 828 only)   | \$ .45 ea. |         |          |
| 3 1/2 x 3 1/2 or 3 1/2 x 5             | .60 ea.    |         |          |
| 5 x 7                                  | 1.25 ea.   | 5 x 5   | 1.25 ea. |
| 8 x 10                                 | 3.00 ea.   | 8 x 8   | 3.00 ea. |
| 11 x 14                                | 6.75 ea.   | 11 x 11 | 6.75 ea. |

#### NO CROPPING ON 2X OR 3X PRINTS

|                                        |                 |
|----------------------------------------|-----------------|
| Kodacolor Processing 120, 35mm 20 exp. | \$1.00 per roll |
| 35mm 36 exp.                           | 1.50 per roll   |
| 35mm Transparency slides from 35mm     |                 |
| or 828 Kodacolor negatives             | .40 ea.         |
| 31mm Transparency slides from 127 sq.  |                 |
| or 2 1/4 x 2 1/4 Kodacolor negatives   | .55 ea.         |

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# SPECIAL MAIL ORDER SECTION

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**Herbert Keppler**  
Editorial Director & Publisher

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THE LARGEST SELECTION ANYWHERE AT PRICES YOU CAN AFFORD

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 FOR BLACK & WHITE & COLOR FILMS — Polarizer, Haze #1, Neutral Density 2X, 4X, Contrast Blue.  
 Diffuser, Mistmaker  
 FOR COLOR FILMS — Skylight 1A, Haze 2A, UV, 82A, 81A, 81B, 85, 89B, 85C, 80A, 80B, 80C, CC Fluorescent D, B, Vibracolor, Rainbow

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- SPIRALITE B&W, color correction and conversion filters are magnesium fluoride coated to keep flare to a minimum\*

Spiralite Filters are preferred by many magazine and newspaper photographers, by government agencies and research laboratories, by universities and photo studios, in short, by critical users who depend on perfect performance.

\*Some Spiralite special purpose filters are, of necessity, of sandwich construction and not coated.



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For prices, special discounts, see below



Rainbow Filter injects the brilliance and varied colors of the rainbow into your color pictures. Its thousands of parallel lines per inch, embossed into the optical material within the Rainbow Filter, deflect or "diffract" the light, producing a line of prismatic color from any visible light source, brilliant highlight or specular reflection in the scene. Its custom mount permits free rotation of the filter to position the prismatic pattern at any point around the source.

The Rainbow Filter is neutral in color recording the general scene in its normal relationships and requires no change in exposure.

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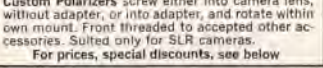
Screws onto your lens just like a filter, produces a sharp circular center image, with the balance pleasantly defocused to the edges, thanks to the strong, positive diopter outer portion around the optically flat center. Requires no exposure increase. Effect is readily seen in SLR finder. Also adapts to enlarger to achieve similar effect in printing.

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FOR THE CREATIVE PHOTOGRAPHER, THE MIST-MAKER transforms almost any scene or portrait into an unusual ethereal-like image. Through changes in exposure and development, the extent of the fog effect can be altered. Neutral in color transmission. Ideal for use on enlargers, too.

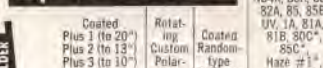
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Eliminate glare and reflections on glass, scenery, water, foliage, windows... reduce atmospheric haze... increase color saturation... emphasize clouds and dark blue skies (the only sky filter suited for color!)

Custom Polarizers screw either into camera lens, without adapter, or into adapter, and rotate within own mount. Front threaded to accept other accessories. Suited only for SLR cameras.

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|--------------------------------------------------------------|---------------------------|-----------------------------|
| Series V                                                     | 2.48                      | 3.50                        |
| Series VI                                                    | 2.98                      | 6.88                        |
| Series VII                                                   | 4.48                      | 8.88                        |
| Series VIII                                                  | 7.48                      | 11.88                       |
| Series IX                                                    | 39.98                     | 18.00                       |
| 46, 49mm                                                     | 4.98                      | 8.44                        |
| 52, 55mm                                                     | 5.98                      | 9.44                        |
| 58mm                                                         | 6.98                      | 12.44                       |
| 62mm                                                         | 7.98                      | 13.44                       |
| 67mm                                                         | 8.98                      | 15.44                       |
| 72mm                                                         | 19.44                     | 17.00                       |
| 77mm                                                         | 21.44                     | 22.00                       |
| 82mm                                                         | 34.44                     | 25.00                       |
| Hasselblad Bayonet                                           | 10.95                     | 18.95                       |



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Allows you to photograph the unsuspecting subject while seemingly aiming at right angles to actual direction of shooting! You get natural expression, avoid self-conscious reaction of subject. Designed to look like part of lens for 'discreet' right angle shots, the Circo Mirroatch is primarily intended for 100mm and longer telephoto lenses. Mounts onto your lens by means of Series VII adapter ring. Precision, optically flat, front surface mirror assures perfect definition with b&w and color film. Ship. Chgs. \$21.95

Ser. VII Adapter Ring (up to 62mm dia.) \$4.50. Case \$2.85 name your camera, lens, speed, focal length, when ordering

\*when used with 'normal' lens, causes some vignetting

The greatest book on filters and special effect attachments ever offered! The all new, completely revised 1976 edition of the most popular Kodak Data Book

Filters & Lens Attachments

Spiratone wants you to have this exciting, profusely illustrated (mostly in gorgeous color) 72 page book which not only explains how filters work and are used, but how to be creative — getting the most out of the wide variety of special filters and multiple image prisms. Many Spiralite front lens accessories are featured in this Kodak book and results obtained are dramatically illustrated.



that exciting attachment that sprinkles every highlight with a starlike radiance. Select any of all models for the greatest variety of effects. Use them singly, or in any combination of mix or match to produce stars that are out of this world.

Readily oriented in their free rotating mounts which set the axes of the cross at any desired angle; front and rear threaded so they can be stacked and used in multiples. Three different patterns:

150 (1mm square mesh) — 250 (2mm square mesh) — 2P (2mm parallel ruled)

Models 150 and 250 both yield a right angle cross pattern. The finer grid of the 150 produces a more pronounced pattern while the 250 pattern is more subtle and less dominating. Two CROSTARS may be combined to produce an eight pointed star pattern.

Imagine the variety of exciting patterns available by combining several 2P CROSTARS in crossed positions, or 2P's with 150 and 250 CROSTARS. SPIRATONE SCREW-IN CUSTOM CROSTARS are available in standard Series VII and VIII sizes to fit regular holders or provided "customized" with adapters to screw into most SLR lenses. They may be rotated freely, independent of the mounting thread, for the desired axis orientation. The Ser. IX, 67, 72, 77mm CROSTARS are front and rear threaded — orientation by mounting threads.

| 49", 52", 55" or 58" | Ser. VII | 62"    | 67"     | Ser. VIII | 72      | 77      | Ser. IX |
|----------------------|----------|--------|---------|-----------|---------|---------|---------|
| 1.50                 | \$8.95   | \$6.95 | \$14.95 | \$11.95   | \$18.95 | \$23.95 | \$20.95 |
| 2.50                 | 8.95     | 6.95   | 14.95   | 11.95     | 18.95   | 23.95   | 20.95   |
| 2P                   | 8.95     | 6.95   | 14.95   | 11.95     |         |         |         |

\* Includes Ser. VII Custom CROSTAR with necessary adapter  
 \*\* some models are Ser. VIII Custom CROSTARS with necessary adapters  
 Shipping Charge 1-250, 2 or 3 250  
 For special discounts, see below



For astrophobic type effects, use MULTIMAGE REPEATER. Different from all other multiple image lenses, the Repeater records half of the subject naturally — but the other half becomes a pattern of continuity, of "repeated" parallel images. Sharpness and number of these can be controlled by changing lens opening, position by rotating Repeater. For the adventurous, the commercial, the imaginative amateur photographer, the Repeater will quickly become his most creative tool.

For prices, special discounts, see below



Coated, colorless cap, screws right into your lens (or in front of filter), can remain on even during exposure. Protection for your lens at all times.

For prices, special discounts, see below

Spiratone wants you to have this book — that's why, with your order for \$10 or more, we are offering it to you at a 50% saving; your cost for this \$1.95 book is only

98c



Multiple image prisms are available in free rotating mount in standard Series VII and VIII sizes to fit regular filter holders or provided "customized" with adapters to screw into most SLR lenses. They work equally well with color and black & white, require no exposure compensation. Thousands of pictures taken with these accessories have appeared in magazines, exhibitions — many movies and TV shows use them.

3P Multimage yields 3 images — all in a line. When rotated, the central image is stationary — others move.

3C Multimage yields 3 images — all concentric. When rotated, all images move.

5C Multimage yields 5 images — one in the center and 4 concentric ones around it. When rotated, central image is stationary, others move.

| 48", 52", 55" or 58" | Ser. VII | 62"     | 67"     | Ser. VIII | 72      | 77      | Ser. IX |
|----------------------|----------|---------|---------|-----------|---------|---------|---------|
| 3P                   | \$13.84  | \$11.84 | \$22.84 | \$22.84   | \$19.84 | \$32.84 | \$35.84 |
| 3C                   | 14.84    | 12.84   | 26.84   | 26.84     | 23.84   | 36.84   | 43.84   |
| 5C                   | 16.84    | 14.84   | 30.84   | 30.84     | 27.84   | 34.84   | 40.84   |

\* Includes Ser. VII Multimage with necessary Shipping Charge 1-250, 2 or 3 250  
 \*\* same models are Ser. VIII Multimage with necessary adapters

For special discounts, see below



Spiratone now has a modern way of producing a vignette for your portraits and your scenes.

The Spiratone Vignetar is an adjustable front lens attachment: ground and polished like a fine lens, designed to produce the most pleasing vignettes. Dependent on focal length of lens, focus and extension setting of Vignetar, the relation between image size and size of the vignette varies, making possible a variety of effects — all clearly discernible on the SLR groundglass. No effect on exposure.

For prices, see below



Stackap FILTER STORAGE AND LENS PROTECTION. Spiratone Stackaps provide the most compact and safest means of storing threaded filters; they fit male and female threads, thus capping front and back ends of either a single or a whole series of filters: one set of Stackaps will do for almost any quantity. The male Stackap also doubles as a lens cap.

For prices, see below



OFFER A BUY FIVE OR MORE Series V, VI, VII, 46, 49mm  
 OR BUY THREE OR MORE Series VIII, IX, 52, 55, 58, 62, 67, 72, 77, 82mm  
 OFFER B BUY TEN OR MORE Series V, VI, VII, 46, 49mm  
 OR BUY SIX OR MORE Series VIII, IX, 52, 55, 58, 62, 67, 72, 77, 82mm  
 AT ONE TIME AND TAKE A 10% DISCOUNT  
 AT ONE TIME AND TAKE A 15% DISCOUNT  
 Discount applies only to items specifically listed above or as indicated in listings — no other merchandise





80-240mm  
TELEPHOTO  
ZOOM

HERE'S WHAT  
MODERN PHOTOGRAPHY  
SAID ABOUT THE SUN  
80-240mm

**SUPERIOR  
QUALITY** ZOOM LENS

WHEN IT WAS ORIGINALLY INTRODUCED AT \$295

"...Sun is the only manufacturer so far to submit one (lens) for the rigors of a standard production run test. We are delighted to say it passed with flying colors. This is a particularly notable feat since the Sun represents a rather great zooming ratio: 3:1, which is more than that of any other macro zoom announced so far."

"...The Sun handles well indeed and, even without macro-focusing capability, it is one of the few lenses of such an extended zoom ratio ever to pass our tests."

"...We were amazed at the extremely small amount of linear distortion, a fault commonly found in zoom lenses. In its macro-focusing mode it was far superior to what we had expected and even better than what you might achieve with a normal-focusing lens used on a bellows or with extension tubes."

"...Overall, the designers and assembling engineers have done a remarkable job of optical balancing to give optimum performance acceptable by professional standards up and down the entire range and extreme usefulness in the macro mode."

## 67mm ACCESSORIES

AVAILABLE AT MODERATE COST  
to fit both lenses

67mm coated yellow, red, green, 80A, 80B, 82A, \$12.00  
85, 85B, UV, 1A, haze, etc. screw-in filters each

67mm Custom Rotating polarizer \$15.44 | 67mm Coated Opticap \$8.00

### LIBERAL 5 YEAR INTERNATIONAL LIMITED WARRANTY BY SUN OPTICAL CO.

For a period of five years from date of purchase, Sun Optical Co. guarantees their Zoom Macro focusing lenses against any defect in materials and workmanship. Any service required, except that caused by mishandling or abuse, is free of charge except for transportation costs. Spiratone and Sun agents in virtually any country will honor this guarantee.

Available only direct from

# TWO truly outstanding fully automatic SUN MULTI-COATED ZOOM LENSES with MACRO FOCUSING to fill the 35mm format with any size subject down to only 4x6"

FACTORY FITTED MODELS (WITH FULL "EE", OPEN  
APERTURE OPERATION), CONSISTENT WITH AUTO CAMERA  
FUNCTION, AVAILABLE FOR THE FOLLOWING CAMERAS:

CANON Ftb, F 1, TX, EF  
EXAKTA (incl. RTL)  
LEICAFLEX SL  
MAMIYA (incl. XTL)  
MINOLTA  
(incl. SRT 101, 102  
(with 1 stop readout) etc.)  
MIRANDA (not EE)  
NIKKORMAT

NIKON  
KONICA AUTOREFLEX  
OLYMPUS OM-1  
PENTAX, PENTAX ES, F, K  
PETRI  
PRAKTICA, incl. LLC  
YASHICA  
and other same mount  
35mm SLR cameras

EITHER LENS

**\$198**

including hood  
and case

Shipping Charge: 80-240mm \$3.00, 38-90mm \$2.50, both \$4.50

SUN OPTICAL CO., one of the oldest and foremost manufacturers of zoom lenses, has designed two lenses which many photographers and lens experts consider the ultimate in quality, versatility and workmanship: the 80-240mm Tele Zoom with macro focusing covering the most desirable of telephoto settings, including in its continuous zooming range such popular focal lengths as 85, 90, 135, 200mm; and the 38-90mm Wideangle to Telephoto Zoom with macro focusing, the lens that comes closest to being a truly 'universal' lens, covering from wideangle through normal to moderate telephoto. In fact, if you owned both of these lenses, you'd have (with only a 10mm overlap) complete continuous zooming from 38-240mm! A greater than 1:6 zoom ratio to cover practically all your photographic lens requirements.

### EASE OF OPERATION

Both lenses offer continuous, uninterrupted focusing from infinity to a 1:4 image ratio at the closest macro setting.

Continuing the regular focusing into the macro range is as simple as pressing a button and equally fast.

### SUPERIOR QUALITY

Zoom ratios and focal length ranges are, however, but one consideration. Often, zoom lenses represent a compromise — swapping 'versatility' for quality. Sun macro focusing zoom lenses perform com-

parably to top quality wideangle, normal and telephoto 'fixed' focal length lenses. In the macro mode, they give you true macro-quality: flat field, corner to corner sharpness — these Sun Zoom lenses will probably outperform by far your normal lens when used with extensions for comparable field sizes.

### MULTI COATED

Sun macro-focusing zoom lenses are multi-coated, a most important feature in a complex lens.

Only when the multiple coatings are an integral computed component of the total optical design can they achieve their optimum function: the control of flare and ghosting, and the achievement of maximum contrast, even under the most severe lighting conditions. Sun MACRO FOCUSING ZOOM lenses were designed that way — multicoating was not just added to a regularly coated lens, as with many other lenses.

**SPIRATONE PROMISES** that the 80-240mm lens you are purchasing will be at least equal to or better in quality than that tested by Modern Photography; and the 38-90mm lens will, in its range, be qualitatively comparable to the 80-240mm lens. In short, you are assured that you'll be getting lenses of outstanding quality.

Spiratone INC. WHEN IN N.Y. VISIT US AT OUR MANHATTAN STORE  
130 West 31st St., N.Y.C. BETWEEN 6th & 7th AVENUES

SEND MAIL  
ORDERS TO

ALSO VISIT OUR FLUSHING STORE (Near Main St.)  
135-06 Northern Blvd., Flushing, N.Y. 11354





## SPECIFICATIONS

|                                                               | 80-240mm Telephoto Zoom                    | 38-90mm WA-Telephoto Zoom                  |
|---------------------------------------------------------------|--------------------------------------------|--------------------------------------------|
| OPTICAL CONSTRUCTION                                          | 14 elements in 12 groups                   | 12 elements in 11 groups                   |
| ANGLE OF VIEW                                                 | 10°-29° (80-240mm)                         | 27°-59° (38-90mm)                          |
| APERTURE                                                      | f/4 - f/22                                 | f/3.5 - f/22                               |
| FOCUSING RANGE, NORMAL MACRO MODE                             | Infinity to 8 feet                         | Infinity to 5 feet                         |
| SMALLEST SUBJECT SIZE FILLING FORMAT, WITH-OUT ANY ATTACHMENT | 8 feet to 14 inches                        | 5 feet to 5 inches                         |
| APPROXIMATE WEIGHT                                            | 4x6 inches                                 | 4x6 inches                                 |
| APPROXIMATE LENGTH                                            | 42 ounces                                  | 24 ounces                                  |
| FILTER SIZE                                                   | 7 1/2 inches                               | 5 inches                                   |
| COATING                                                       | 67mm                                       | 67mm                                       |
| LENSHOOD                                                      | multiple layer                             | multiple layer                             |
| ROTATING TRIPOD MOUNT                                         | included in price                          | included in price                          |
| DIAPHRAGM                                                     | yes                                        | yes                                        |
| WARRANTY                                                      | fully automatic, meter coupled, clickstops | fully automatic, meter coupled, clickstops |
|                                                               | 5 years by Sun Optical Co.                 | 5 years by Sun Optical Co.                 |

**BUY BOTH OF THE MAGNIFICENT SUN MACRO FOCUSING ZOOM LENSES AT ONE TIME — and we'll sell you one of our marvelous TOP GRAIN COWHIDE BAGS MADE TO SELL ORIGINALLY FOR CLOSE TO \$100, FOR ONLY \$20**

Measuring about 12 x 5 1/2 x 9", it is made of a rich handrubbed topgrain leather on a rigid custom veneer frame, with a plush pile velvet interior and heavy duty hardware. A front accessory pouch, a filter compartment inside lid, an adjustable interior compartment organizer and a 3-piece, wide, adjustable "comforter curve" shoulder strap are additional features.

If bought with one Sun lens \$30



Now! With every SLR camera you can

# DATE YOUR SLIDES and NEGATIVES

with MONTH DAY YEAR

## AUTOMATICALLY AT THE TIME OF EXPOSURE

Right in the corner of the image itself

WITH THE EXCLUSIVE

# Spiratone

## RECORDATE™

Whether you're an engineer, scientist, archaeologist, photo journalist, teacher — or just a photographer with a sense of history, the Spiratone RECORDATE is for you; this simple attachment mounts directly to most any moderate wideangle or normal lens on most any camera.

Its adjustable rotating mount permits placing the date record unobtrusively in the corner of the image area, a simple focus control produces a sharp date record regardless of how you focus the camera lens.

Never again a question of the date of exposure — it's right in the picture, not on the mount.

Available to fit standard screw-in mounts up to 62mm and Series VII. Specify size needed. Extra fittings, each \$5 Shipping Charge \$1.00

MAKE YOUR CAMERA INTO A MORE USEFUL RECORD MAKER WITH THE SPIRATONE RECORDATE

# \$34.95

FLASH ADAPTER, reflects light from camera mounted strobe onto Recordate prism to record date imprint when existing light is inadequate... \$1.95

## FRESH 35mm KODAK FILM

FACTORY PACKED

Identical to that used in the regular expensive 20 and 36 exp. cartridges — good for several years. And 100' make about 35 36 or 33 20 exp. rolls! What a saving!

PLUS X • TRI X • PANATOMIC X

50' \$6.25 100' \$11.95

Ektachrome, Ektar, daylight, or ER (high-speed, specify day-light or tungsten), 100

±\$0.05 High Contrast Copy Two 50' 100' total pack \$11.95

Ship. Chge. per roll out, as when ordered by retail, \$1.00

## DELUXE 35mm DAYLIGHT BULK FILM LOADER

Uses economical bulk rolls, color and b&w, 50' or 100' — loads desired length of film into any cartridge in cassette. Scratch-proof loading, from 100' (100 feet) light trap — film does not touch loader, goes right into cartridge. Molded construction, automatic frame counter counts individual frames. Safety design provides door auto lock in winding position. Detachable cassette compartment door makes for better accessibility.

Deluxe Loader Model \$9.95

## STANDARD MODEL

Daylight Loader 100' capacity, measures by counting turns, simple and foolproof

# \$5.95

Ship. Wt. of deluxe model 1 lb., of standard 2 lbs., with 100' film, 3 lbs. and 4 lbs.

**save on combi offer "c"**

BUY KODAK BULK FILM ROLL AT SAME TIME AS LOADER AND:

- deduct \$1.00 from total
- get FREE 5 metal cartridges (reusable)
- get FREE anti-static film cleaner

Example: Deluxe Loader, 100' Plus X, 5 cartridges, film cleaner, all for \$20.90

## 35mm CARTRIDGES

All metal, reusable, made by GAF for Spiratone 12 for \$3.00

Ship. Chge. 1 each, bought or separately \$1.00

## ANTI-STATIC COLOR and B&W FILM CLEANER

Cleans all films without damage from dyes, makes film static free and virtually dust free. 4 oz. bottle \$1.40

Considered by many the best slave at any price

# Spiratone SLAVEMAKER™

So ultra sensitive, it triggers strobe at over 100' with bounce light. Solid state circuitry encapsulated in clear epoxy resin. Tiny weighs only 4 1/2 oz. Practically indestructible — immune to extreme shock, heat and humidity. Allows use of fastest shutter speed available in-strobe — avoids ghost images. Reacts only to strobe (electronic flash) — no amount of ambient light, even sunlight, can trigger it. Fits slides with standard household type color directly — or PC cord tip with PCN converter. (11 \$5)

# \$13.95 3 FOR \$37.95

extra! Ship. Chge. 20¢

Clean negatives, transparencies, film, film holders, enlargers, optics by rubbing them of "static" and dust at the same time with a

## STATICMASTER BRUSH

Strip of polyonum neutralizes static charge on the surface. Neutradex surfaces remain free of dust and lint until recharged by rubbing or handling. Staticmaster is a tool for removing static electricity — the camera's hair brushes are used only for removing neutralized dust particles. Staticmaster Model #C200 with one replaceable cartridge. Order No. 130311 \$4.99

Ship. Chge. 20¢

the 100° Spiratone

# 18mm f/3.2

FULLY AUTOMATIC, METER-COUPLED

## ULTRA WIDEANGLE LENS

It covers a diagonal angle of 100° — almost 120° wider than normal lens, 50% wider than a 28mm!

It produces a true W.A. image; straight lines remain straight, undistorted as they do with a good 35 or 28mm. No "fish-eye" effect.

It covers 8 (yes, eight) times the area of the "normal" 50mm lens, 4 times as much as a 35mm, almost 2 1/2 X as much as a 28mm!

It "compresses" the required working distance by well over 60%. For example, to photograph a group or an interior which fills the 35mm frame with the 18mm at 20 feet, you'd have to push the wall back to over 54 feet to get it all in with a 50mm.

Its depth of field is startling: At f/22, everything from 16" to infinity is "in focus". At f/5.6, depth of field extends from 4" to infinity.

Its near focusing range is equally impressive: the helical focusing mount focuses all the way to 8"! Just imagine the striking viewpoint, the startling perspective that can be achieved by taking a close look at the world through the unique wide window of the Spiratone 18mm!

It requires no mirror lockup — with the 18mm, you view and focus in the usual manner.

It's fully automatic, meter-coupled on all popular 35mm SLR's, operates just like your normal lens.

Diaphragm openings to f/22.

It's only 2 3/4" long, less than 3" across at front end, weighs 11 oz.

It utilizes a 10 group, 12 element retrofocus design, with a combination amber/magenta coating.

Ship. Chge. \$1.75

ACCESSORIES FOR THE SPIRATONE 18MM:

Custom Case \$ 5.95

Special Ultra Wideangle Lenshood \$11.95

| this is the chart from MODERN PHOTOGRAPHY'S TEST REPORT | Aperture | Center Sharpness | Edge Sharpness |
|---------------------------------------------------------|----------|------------------|----------------|
| 3.5                                                     | 4        | Excellent        | Very Good      |
| 4                                                       | 5.6      | Excellent        | Good           |
| 5.6                                                     | 8        | Excellent        | Good           |
| 8                                                       | 11       | Very Good        | Excellent      |
| 11                                                      | 16       | Excellent        | Good           |
| 16                                                      | 22       | Very Good        | Good           |

\*latest model has slightly greater f/3.2 speed

for EXAKTA MAMIYA MINOLTA MIRANDA NIKKORMAT NIKON PENTAX PETRI PRACTICA YASHICA and most other same mount 35mm focal plane SLR cameras

# \$114.95

FOR CANON F1, Fth, EF KODAK AUTO-REFLEX MAMIYA XTL PENTAX ES, F.K OLYMPUS OM-1

# \$124.95

the Spiratone

# VARIABLE MACROVAR™

A SINGLE CONTINUOUSLY VARIABLE CLOSE-UP UNIT DOES THE JOB OF SIX OR MORE FOR THE COST OF JUST THREE!

takes the place of a whole series of close-up lenses and fills the full 35mm negative or slide with a subject as tiny as 1/32", 1/64", or as large as 8x12", or any size in between.

screws directly into your normal lens, does not affect exposure or automatic diaphragm operation

handy silky smooth focusing ring with reproduction ratios (which tell relationship of subject to image on film) neatly engraved in large numerals

front threaded for use with other accessories

coated and color-corrected optics are mounted in an elegant metal black and satin chrome finish barrel, with built-in shade

Despite its astounding range, the MACROVAR weighs only 4 1/2 oz. and is just 1 1/2" long. It is available custom fitted for Pentax, Nikon, Minolta, Canon, Mamiya, Yashica and just about all other 35mm SLR's with f/1.4 and slower (f/1.8, f/2, etc.) lenses (with camera lens set at f/8). Even smaller subjects will fill full 35mm size with closer focusing lenses! Available in screw-in sizes from 40.5 to 58mm and Series VII. (Spiratone's new design)

Ship. Chge. \$1.00

# \$19.13

Custom Case \$1.82

TURN PAGE FOR Spiratone FILM, DARKROOM, CLOSE-UP and SLR VALUES



**The Amateur's "PROFESSIONAL" SAFELIGHT**

The smallest (6x4x7 1/2"), most convenient safe-light accepting standard 5x7" interchangeable filters. Swivel bracket mounting for wall or shelf, looks at any required angle. Complete with "OC" type filter for black and white enlarging and contact papers, 6 ft. cord with switch and 15 watt lamp.

**\$8.95** Shpg. Wt. 2 lbs.

**CHOICE OF EXTRA SPIRATONE 5x7 FILTERS:**

yellow-green, orange, red, #10 (for color ppt.) white (for examining negatives, slides, for retouching) each \$5

**3 FILTER SAFELIGHT BARGAIN**

AMATEUR'S "PROF." SAFELIGHT, "OC" plus two other Spiratone filters of your choice—out \$16.95

**New! BIO-DIAL ENLARGING TIMER**

Model G0

60 sec. range, with second markings. Current shuts off automatically at end of desired time interval. Built-in lock holds knob at desired position until trigger button is pressed. Adjustable stop for repeat exposures. Manual operation for focusing. Enlarger or printer plugs right into timer receptacle. Shpg. Wt. 2 lbs.

**\$9.95**

**Spiratone ENLARGING FOCUSER \$4.49**

**Want SHARPER Enlargements?**

Utilizes aerial image system by focusing on grain — perfect focus can be determined even from unsharp negatives and at the biggest magnifications. Shpg. Wt. 1/2 lb.

**4 IN ONE ENLARGING ESSEL**

for the fast worker

For rapid working with fixed sizes, the 4 in 1 in 2 1/2x3 1/2, 3 1/2x5 1/2, 5x7 on one slide 8x10 on the other. Study all metal construction with rubber feet. Plastics hold paper in place for foolproof inserting. Shpg. Wt. 3 lbs.

**\$9.98**

**ULTRA PRECISE Spiratone DIAL THERMOMETER**

Essential for all b&w and color processing — particularly with the more critical high temperature processes.

- 2 1/2" diameter luminous dial calibrated in F° 160-160° and C° (15-70°)
- Easy to read calibrations in 1/2° graduations.
- Provision for RECALIBRATING assures accurate performance even after years of use.
- 8" stainless steel stem with sliding slip for tank, tray, or storage.

**\$8.95**

Order No. 135305 Shpg. Charge 75¢

**DARKROOM COMFORTER**

**Double DARKROOM VENTILATOR**

Made to our specifications by a major domestic manufacturer of exhaust fans, features a super quiet fan, powered by a heavy duty, virtually maintenance-free motor.

The Spiratone Darkroom Comforter exhausts 50 CFM, more than enough to remove the stagnant fume laden air of the average darkroom and maintains constant circulation of fresh air. Suitable for mounting into a wall or on a shelf, with only a three inch diameter hole for the exhaust elbow, the ventilator includes decorative 9 1/2" x 9 1/2" grill, matte black housing and elbow, quiet plastic impeller, and bared wire leads for power supply. A small investment for a lifetime of comfort at only

**\$19.95**

Shpg. Wt. 8 lbs.

**the only way to solve the darkroom dust problem is to eliminate it WITH A Spiratone ELECTRONIC AIR CLEANER**

Sweeps darkroom air clean, electronically trapping up to 85% of all airborne particles. Helps keep your darkroom free of dust, chemical fumes, pollen, smoke — even bacteria and mold spores — down to sub micron (less than 1/25,000") size. Negatives held close to unit's air intake and simply tapped or lightly brushed clean fast — dust is sucked in and trapped, can't land back on negative! Metal filter snags net for quick cleaning in soap and water or dishwasher. Circulating 120 CFM, the cleaner efficiently handles rooms up to 15x20'. Enclosed in an attractive, vinyl-clad metal housing, the Spiratone Electronic Air Cleaner has a two speed, whisper quiet fan, solid state circuitry, uses less electricity than a 100 W bulb, is UL listed, rugged enough for full time professional use. It easily rivals similar units selling for several times its price. While we're recommending the Spiratone Electronic Air Cleaner to solve the darkroom dust problem, you'll no doubt want to use it in every room!

**\$99.95**

Shpg. Wt. 16 lbs.

**ENLARGING EXPOSURE PROBLEMS SOLVED**

Just as simply as you metered your original shot (in the camera), you can now meter your enlargements with Spiratone's

**\$19.95**

Shipping Charge 75¢

**Spiratone VALUES for the DARKROOM**

For a complete catalogue on darkroom equipment including color printing kits, complete enlarger outfits from \$99.95, much more — send 25¢ stating your interests

**It's Here! It's Simple to Use! It's Typically Spiratone-priced!**

**It's the latest, the best, the most efficient way to make COLOR PRINTS directly from slides**

**IN YOUR OWN DARKROOM IN 12 MINUTES**

"Now you can directly enlarge your favorite color slides into brilliant and dramatic color prints without elaborate equipment; without complicated processing techniques; without interferences; at room temperatures; and have a ready-to-dry print in just 12 minutes!"

This is not advertising puffery by the manufacturer but the experienced evaluation of photographic editors, reporters, and users of the new CIBACHROME SLIDE PRINTING MATERIALS.

Spiratone is proud to introduce their P→P COLOR PROCESSING KIT to enable you to take full advantage of the new Cibachrome (color print direct from slide) process. This kit includes the P→P (Ciba) materials and our finest temperature-controlled drum processor and represents the outstanding value in a starter set. It is comparable not only with the P→P (positive to positive) color print process but with all the negative to positive print systems as well.

Here's what the P→P (positive slide to print) kit includes:

- Spiratone's Complete Temperature Control Drum Color Processing System for prints up to 11x14", including a special suspension tray for maintaining temperatures of drum AND of solutions being used, with convenient drum agitating feature, extra print wash attachment (for washing b&w and color prints up to 8x10"), seven 4 oz. bottles for all solutions.
- Spiratone's 22 pc. Color Printing Filter set, for all colorized drawings 3 1/2x3 1/2" or smaller. Includes all the magenta, cyan, yellow filters and UV you'll need for any process.
- 20 sheets 8x10" Cibachrome Color Print Material.
- Cibachrome 3-step 12 minute Chemistry Kit to process 20 8x10's. Shpg. Wt. 8 lbs. Order No. 105406
- Cibachrome Color Print Manual, with pull-out charts for exposure and processing.

**\$34.95**

Shpg. Wt. 4 lbs. Order No. 111682

**Spiratone's 22 pc. Color Printing Filter set, for all colorized drawings 3 1/2x3 1/2" or smaller. Includes all the magenta, cyan, yellow filters and UV you'll need for any process.**

**\$14.95**

Shpg. Wt. 1 lb. Order No. 105406

**20 sheets 8x10" Cibachrome Color Print Material.**

**\$25.00**

Shpg. Wt. 2 lbs. Order No. 107220

**Cibachrome 3-step 12 minute Chemistry Kit to process 20 8x10's. Shpg. Wt. 8 lbs. Order No. 105406**

**\$15.00**

**Cibachrome Color Print Manual, with pull-out charts for exposure and processing.**

**\$5.00**

Shpg. Wt. 1 lb. Order No. 105163

**ALL ITEMS ARE AVAILABLE INDIVIDUALLY — COST WHEN PURCHASED SEPARATELY, \$94.85**

**Now — Dry Regular or RESIN COATED PAPERS UP TO 11x14**

**13 1/2 x 18" ALL METAL TWIN SURFACE DUO-DRYER**

**WITH AUTOMATIC THERMOSTAT AND PILOT LIGHT**

A complete, ready-to-use double surface dryer with a capacity of 4 8x10 or 36 2 1/2x3 1/2 prints, single weight, double weight, glossy or matte finish — even with the latest resin coated papers. Sturdily constructed as efficient as units costing several times as much. Adjustable apron tension. Works on AC or DC.

**\$25.95**

Complete with deluxe double print roller, ferrotype polish and 2 12x17" Apollo chrome ferrotype plates

Order No. 112240 Shpg. Wt. 15 lbs.

**12"x16" STANDARD DUO-DRYER with 2 10x14" Apollo Chrome ferrotype plates for regular glossy and semi-matte papers. For the small darkroom. Has no thermostat. Model D-1216. Shpg. Wt. 10 lbs. Order No. 112186 \$15.99**

**TRAYS FOR YOUR DARKROOM**

|                | Shpg. Wt.            |
|----------------|----------------------|
| 5x7"           | 3 for \$ 2.75 2 lbs. |
| 8x10"          | 3 for 3.75 2 lbs.    |
| 11x14"         | 3 for 6.95 5 lbs.    |
| 16x20"         | each 8.95 4 lbs.     |
| with drain     | 3 for 24.95 12 lbs.  |
| 15x20x2 1/2x5" | each 4.95 3 lbs.     |
| Hypotray       | 3 for 13.95 14 lbs.  |

All trays of acid resistant plastic, 16x20 of chipproof, acid-resistant styrene

**ENLARGING METER/COMPUTER**

**PAYS FOR ITSELF QUICKLY SAVINGS IN PAPER AND TIME**

**A.C. OPERATION** — Readings not affected by voltage fluctuations

**EXTENDED SENSITIVITY** — Exposure range 1 to 120 seconds, for all types of negatives, smallest to largest magnifications

**VINYL-CLAD METAL HOUSING** — made in U.S. — finest electronic components and most advanced circuitry

**DETAILED INSTRUCTIONS** — quick, three step method for beginner, complete technical and sensitometric data for advanced worker

**\$16.95**

**Spiratone LC356 FLOATING HEAD PARALLELOGRAM 16mm and 35mm to 2 1/4 x 2 1/4 ENLARGER**

**FOR BLACK & WHITE AND ALL COLOR PRINTING SYSTEMS**

Compares favorably in features, precision and versatility with \$100 and up enlargers. Priced for the beginner, yet won't be "outgrown" when you get into the "advanced" or professional class.

**\$59.95**

Enlarger with choice of cm carrier

For The LC356

features: • 14 x 20" baseboard • an easily stored 26 1/4" dia. steel pole • precision bellows for accurate focusing • double condenser for maximum contrast for all negative sizes • red filter • line-switch • Leica threaded • well ventilated lamp housing • all metal precision throughout • a color head with drawer for filters for color printing or variable contrast papers • easy raising parallelogram system • instant versatility to copystand • choice of glassless, dustfree carrier in six sizes at \$4.95 each—see accessory listing on right. Shpg. Wt. 25 lbs.

Glassless, dustfree carrier with lever lock, your choice of 2 1/4x2 1/4, 35mm, half-size (single-frame) 35mm, superslide, 126 (instant), submini. (9-13mm), #110 (16x12mm), and special model for 2x2" mounted slides. ea. \$4.95

Best Absorbing Glass, especially useful for color printing. \$5.95

Diffuser (for softer prints, also reduces grain) \$3.95

Set of 4 EX Var. Con. Filters \$4.00

Set of 2 #211 Ed. Lenses \$2.00

Set of 22 3 1/4x3 1/4" OP filters (for all color processes) \$14.95

If purchased at same time as enlarger \$17.47

**Don't let the low prices fool you!**

**Spiratone TOP QUALITY ENLARGING LENSES**

compare favorably with the finest available. In independent tests they proved to match in performance, lenses acknowledged to be the choice of the most critical professionals and which were priced three to six times the cost of the Spiratone lens!

In choosing an enlarging lens, you must keep in mind that it is the very heart of your enlarging system — your finest exposures, your best printing techniques cannot correct for a deficiency in your lens.

Spiratone enlarging lenses are high contrast, fine resolution, flat field lenses specifically designed to bring out all the detail in your negative or slide in the enlargement. Spiratone antistatic enlarging lenses are coated, corrected for black & white and color, have clickstops and standard Leica threads to fit Spiratone and most other modern enlargers without the need for a flange.

Spiratone enlarging lenses are available equipped to accept all kinds of filters, diffusers, special effect attachments in Series VII (or, with optional Customlens, in popular screw-in sizes as well). Select the focal length and model suited for your needs.

• 1 3/4" (35mm) f/3.5, for sizes smaller than 35mm and for bigger magnifications from cropped portions of 35mm \$14.75

• 2" (50mm) f/3.5 for 35mm, 126 \$14.95

• 3" (75mm) f/3.5 for 2 1/4x2 1/4 (6x6cm) \$15.95

• 6" (150mm) f/4.5 for 4X5", slightly smaller sizes \$28.95

**\*SPECIAL SERIES VII THREADED MODEL to accept VII accessories, 2" \$16.95 just like a camera lens: 3" \$17.95**

\*These lenses suited for Spiratone LC 356, A66 models, most other Leica threaded lensboards. Shpg. Charge 5¢ per lens

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**16x 35" or 120 \$228 Ea.**

**STAINLESS STEEL REELS** 36 exp. capacity

Laboratory grade heavy gauge stainless steel, precision finished, protects film against scratches. Skeleton spiral design allows superior loading and maximum circulation of chemicals. Compatible with Kodak, Kodamint tanks.

**STAINLESS STEEL ALL METAL TANKS**

| Reg. size, with one 35mm reel                                                 | 1-4 ea. | 5-9 ea. |
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| Double size, with two 35mm reels                                              | 6.98    | 5.98    |
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| 7" size, capacity two 120 or four 35mm reels, without reels, with lifting rod | 9.98    | 8.98    |

Shpg. Wt. for tanks, reg. with 35mm reel 1 lb.; 400, with 2 reels 2 lbs.; 7" 5 lbs.

**MULTIPLE REEL STAINLESS STEEL TANKS**

| Model | Capacity                        | Price   | Shpg. Wt. |
|-------|---------------------------------|---------|-----------|
| 12"   | capacity 4 120 or 8 35mm reels  | \$17.95 | 11 lbs.   |
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**Loading 35mm or 120 Stainless Steel Reels is a pleasure with this handy DUAL REEL LOADER**

Soap either size reel into the spring loaded tank. Shaped film guides cup the film for foolproof loading. Mount loader to work surface with clamp supplied.

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**\$3.99**

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Stainless Steel Film Clips, 1000 per box \$17.95, 500 per box \$9.95. Shpg. Wt. 10 lbs.

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10260 hr. \$1271.50, 10290 hr. \$1275.00, 10320 hr. \$1278.50, 10350 hr. \$1282.00, 10380 hr. \$1285.50, 10410 hr. \$1289.00, 10440 hr. \$1292.50, 10470 hr. \$1296.00, 10500 hr. \$1299.50, 10530 hr. \$1303.00, 10560 hr. \$1306.50, 10590 hr. \$1310.00, 10620 hr. \$1313.50, 10650 hr. \$1317.00, 10680 hr. \$1320.50, 10710 hr. \$1324.00, 10740 hr. \$1327.50, 10770 hr. \$1331.00, 10800 hr. \$1334.50, 10830 hr. \$1338.00, 10860 hr. \$1341.50, 10890 hr. \$1345.00, 10920 hr. \$1348.50, 10950 hr. \$1352.00, 10980 hr. \$1355.50, 11010 hr. \$1359.00, 11040 hr. \$1362.50, 11070 hr. \$1366.00, 11100 hr. \$1369.50, 11130 hr. \$1373.00, 11160 hr. \$1376.50, 11190 hr. \$1380.00, 11220 hr. \$1383.50, 11250 hr. \$1387.00, 11280 hr. \$1390.50, 11310 hr. \$1394.00, 11340 hr. \$1397.50, 11370 hr. \$1401.00, 11400 hr. \$1404.50, 11430 hr. \$1408.00, 11460 hr. \$1411.50, 11490 hr. \$1415.00, 11520 hr. \$1418.50, 11550 hr. \$1422.00, 11580 hr. \$1425.50, 11610 hr. \$1429.00, 11640 hr. \$1432.50, 11670 hr. 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Spiratone TELXTENDERS transfer all automatic body functions (diaphragm, meter coupling, EE operation, open aperture metering)—right onto your lens so that the required exposure compensation (2 stops with 2X, 3 stops with 3X) is also automatic—NO FIGURING NECESSARY.

| 2X                                                                                                                | 3X         |
|-------------------------------------------------------------------------------------------------------------------|------------|
| TELXTENDER                                                                                                        | TELXTENDER |
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Its accessory shoe of camera, shoe adapter, flash bracket, or threads onto tripod or tripod thread of L33 or Unistand. Locks sturdy in any V18 position. Order No. 201324. Ship. Chgs. \$1.50

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The VARIO-DUPLISCOPE incorporates into a single unit, which mounts directly to your camera body, a high quality flat field special optical system designed specifically for duplicating an interchangeable slide stage providing VERTICAL, HORIZONTAL and ROTATIONAL adjustment for total cropping control, an adjustable magnification dial control from life size 1:1 to area magnifications of 4X (this means you can blow up a part of your slide only 6 square inches to the full 35mm slide).

The slide stage has spring loaded dual tracks, one for the 2x2" mounted original and one for 2x2" or series VII filters, allowing you to add the exciting process of "rephotography". A hinged diffusion plate assures even illumination, and in the swing-away position, maximum brightness in focusing and composing. Carrying and Storage Pouch \$2.99

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1:1 non-variable model, similar in construction to Vario model, with fixed 2 x 2 slide holder.

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## KODACOLOR

Continued from page 83

coloration is due to residual color couplers (one reddish, the other yellow) that are incorporated in two of the emulsion's layers during film manufacture. (Although our drawing—far right top, page 83—appears to show five layers, the second and fourth masking layers are incorporated with the third and fifth layers.) The couplers remaining after development are, in fact, positive dye images that act as masks during printing of the film and result in significant improvements in color reproduction. With this step forward, the prints obtainable with multilayer color negatives and paper were quite comparable to those obtained with highly involved professional processes.

Of course, poor color quality wasn't the only problem with the original 1942 Kodacolor—its film speed was also far too low. Kodacolor, as introduced in 1942, had to be fast enough to obtain adequately exposed negatives of subjects in bright sunlight at the only exposure setting normally available with box cameras—1/30 sec. at f/11. This was only barely possible with the initial film speed of ASA 20. And so, as soon as it was technically feasible, Kodacolor's film speed was increased by 1/2 f-stop (in 1955) and increased again (in 1963) so that the recent Kodacolor-X film requires a bright sunlight exposure of only 1/125 sec. at f/11. These gains in film speed are particularly impressive when you consider that improvements were simultaneously being made in grain structure and sharpness, factors that don't normally improve as film speed is increased.

### Sharper images were needed

Sharper color images with finer grain were additional goals. The image structure of early Kodacolor was only acceptable for printing relatively large-area roll-film negatives. These negatives would not yield satisfactorily sharp prints from images as small as a 35mm frame. The introduction of a 35mm film, therefore, had to wait 15 years, until 1958, for sufficient improvements to be made in the grain and sharpness characteristics of the emulsion. Image quality was improved again when Kodacolor-X became available in 1963.

But life is never easy for the film manufacturers. By the time they had surmounted the requirements and produced a good-quality color negative film for the 35mm format, a new "small target" was appearing on the horizon. The ever-increasing interest in smaller cameras (half-frame 35's and ultraminiaures) made it apparent that even better film quality would be essential if one was to obtain satisfactory-quality amateur prints of reasonable size from such diminutive negatives.

So, it was "back to the drawing board" to design a new film having even better resolution and grain structure. A completely different film and a new processing chemistry had to be designed to reach the goal of amateur-size prints—from smaller negative images—that were comparable to those formerly obtainable from Kodacolor-X film images two or three times as large. Kodacolor II film and Flexicolor chemicals (for process C41) were the results of this effort and were made available in 1972. The improved image quality not only made practical the small 110-size format, but it also resulted in improved 35mm and roll films as the new technology was made available in these film sizes. These advances in grain and sharpness are graphically shown on page 82.

### Who needs yellow prints?

While we've been emphasizing film technology, the problems of printing materials cannot be overlooked. The solutions to these equally sticky dilemmas have received little publicity, but a significant series of improvements have been made to extend the life expectancy of Kodacolor prints. The stability of the dye images in the earliest Kodacolor prints was not very good. Even more objectionable than their dye fading was an overall yellow coloration of the image and margins that appeared in a relatively short aging time—3 to 4 years (this is graphically demonstrated on page 83). This yellowing made most early Kodacolor prints unsatisfactory—whether stored in the dark or not. A series of improvements in the late 40's resulted in much better print stability ten years later, and further improvements have been made since then. Most album-stored prints made as early as the late 1950's look about the same today as when they were made. If the negatives of some of the early photographs were stored properly and are now reprinted on today's Ektacolor paper, quite acceptable results are obtained, as you can see on page 83.

While we will probably never be completely satisfied with the stability of color prints composed of dyes, the improvements that have already been implemented should make us reasonably confident of a good life expectancy for prints that are properly processed. Inevitably, the effective life of color prints depends partly on how they are stored. If kept away from bright light, heat and humidity, there is now little reason to be concerned about the long-term life expectancy of recent Kodacolor prints.

Most improvements in the color-print systems we've described were done completely outside the user's field. For example, vast strides had to be made in evaluating and printing color negatives and then processing them in "produc-

Continued on page 124



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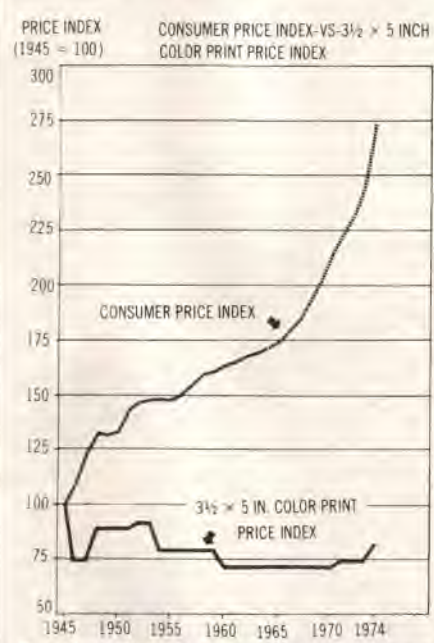
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## KODACOLOR

Continued from page 122

tion" quantities. In all these categories—the evaluation of negatives for printing, the exposure and processing of the paper, and the automation of the machinery itself—many significant changes took place before it was possible to produce the much finer color prints of today at prices that are approximately the same as those charged for the first Kodacolor prints over 30 years ago (as you can see from the table below).



**Best bargain today: color prints?** You'd better believe it. Compare stability of print prices vs. total consumer price index for nearly 30-year span.

The most fundamental of these changes have occurred in the methods of evaluating the processed Kodacolor negatives to obtain information about how they should be printed for proper exposure and color balance. Visually, the negatives are not very informative and, of course, trial and error printing is prohibitively expensive. The early Kodacolor film received for processing by Kodak was given a controlled-exposure patch at the end of each roll before processing. This reference patch, when measured, gave an indication of how that roll of negatives should be printed, since the characteristics of the patch (red, green and blue densities) would yield information about how that emulsion and that particular processing run compared with other emulsions and processing runs. After the patch was measured, the edges of the negatives were perforated to show what the control patch indicated to be the best print exposure and filtration conditions. As you might surmise, the yield of acceptable "first time" prints obtained with this system was not very high and reprints were often required—an expensive and involved procedure.

However, a concept proposed by Ralph Evans in 1951 opened up a new approach to color-negative evaluation. The basic idea was that if an optimum print was obtained from a typical negative, and that negative's average red, green and blue light transmissions were determined, then any unknown negative printed the same way would also yield an acceptable print. All that was required was to arrange the printing machine so that the same amounts of red, green and blue light arrived at the paper when printing the unknown negative as was used when printing the typical negative. Using this technique, the yield of satisfactory prints from the first printing was still not 100 percent, but it was much better than the results obtained with previous "automatic" printing systems.

This new system also opened the way for many sophisticated electronic means of rapidly evaluating and establishing optimum printing conditions. The early printing machines based on the Evans proposal required some operator judgment and adjustments in printing for the best yield of acceptable prints. Today, the most advanced (and very expensive) printers will automatically print several thousand negatives per hour without any human input beyond keeping the machine in proper operating condition. Applying electronics and engineering to the original color-negative concept made it possible to handle the increased volume of prints and produce them at a relatively stable and reasonable cost. (To see how effective such electronically-automated printing has been in keeping cost low and print quality high, study the graph at left.)

### Cutting down on solutions

Processing improvements—fewer chemical solutions and shorter times—and better processing machines have also contributed to system growth and print price stability. Instead of 1956 procedures, which required seven solutions and had a processor productivity of 1 1/2 ft. per min., we now have three solutions and processor capabilities of up to 15 ft. per min. Furthermore, chemical changes have decreased pollution and resin-coated papers have cut down on chemical waste.

In addition to these major areas, there have been many other changes designed to improve the system from the standpoint of the user. Such changes as increased exposure latitude in the film, the elimination of the need for two different films for daylight and artificial-light use (1955), and the availability of different paper surfaces in prints, have all contributed to the steady growth and increased user acceptance of negative-positive color photography. We have indeed come a long way. And who can say how far we shall go in the next 30 or so years?—THE END



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1.8 SC . . . . .210

FTB n body only . . . . .154

FTB n w/50/1.4 SC . . . . .245

for black, add . . . . .15

for case, add . . . . .309

F-1 body only . . . . .309

F-1 w/50/1.8 SC . . . . .377

F-1 w/50/1.4 SC . . . . .412

17/4.0 FD Auto SSC, cs 180

20/2.8 FD Auto SSC, cs 153

24/2.8 FD Auto SSC, cs 180

28/2.8 FD Auto SSC, case . . . . .140

28/3.5 FD Auto SC, case . . . . .120

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50/3.5 Macro Auto SSC, case . . . . .140

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100/2.8 FD Auto SSC, case . . . . .120

135/3.5 FD Auto SC, case . . . . .95

135/2.5 FD Auto SC, case . . . . .143

200/2.8 FD Auto SC, case . . . . .278

200/4.0 FD Auto SSC, case . . . . .148

300/5.6 FD Auto SC, case . . . . .220

100-200/5.6 Zm, case . . . . .162

80-330/4.5 FD Auto SSC, case . . . . .499

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## EF w/50

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EF w/50/1.4 SC . . . . .373

for 1.2 instead of . . . . .57

1.4 add . . . . .57

for case, add . . . . .169

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(F1) Angle Finder B . . . . .37

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(F1) Servo EE Finder Set . . . . .240

## EL w/50/2.0 Auto

IC Nikkor . . . . .345

Nikkormat FT2 body K Screen 163

for black, add . . . . .22

for case, add . . . . .22

EL body w/k Screen . . . . .274

for black, add . . . . .274

for case, add . . . . .25

Nikon Photomic F2 body . . . . .375

Nikon Photomic F2 w/50/2.0 . . . . .449

Nikon Photomic F2S body . . . . .450

Nikon Photomic F2S w/50/2.0 . . . . .520

for black, add . . . . .15

for case, add . . . . .15

for 1.2 instead of 2.0, add . . . . .55

for 1.2 instead of 1.4, add . . . . .65

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Slide Copy Att. PS 5 . . . . .88

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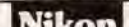
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## SRT 202 w/50/1.7

MC Rokkor X 249

SRT 202 body

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SRT 201 50mm F1.7 Rokkor X 220

SRT 201 50mm F1.4 Rokkor X 245

for Case, add . . . . .17

for Black, add . . . . .10

XE-5 Body only . . . . .240

XE-5 50mm F1.7 Rokkor X . . . . .310

XE-5 50mm F1.4 Rokkor X . . . . .335

XE-7 Body only . . . . .285

XE-7 50mm F1.7 Rokkor X . . . . .350

XE-7 50mm F1.4 Rokkor X . . . . .375

for Case add . . . . .23

For 1.2 instead of 1.4 add . . . . .49

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Auto Pack & D12 Movie Cam. . . . .580

Hi Matic E w/Electro flash/cs.115

Hi Matic FP w/Flash case . . . . .89

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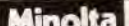
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## SRT 101 w/50/1.7

MC Rokkor X 199

SRT 101 body

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NEW MINOLTA ROKKOR LENSES

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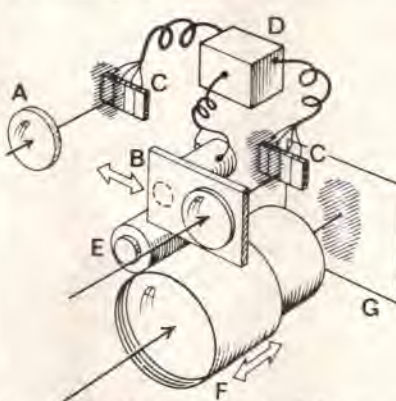
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# behind the scenes

**How does Honeywell's Visitronic Auto Focus work?—two 110 SLR's—fast-focus Sigmas—a faster, cheaper, super-speed Leitz Noctilux?**

After much musing, cogitating and head scratching over the possible configuration of Honeywell's Visitronic Auto Focus system (first reported in "Behind The Scenes," Dec. 1975, page 184) MODERN's technical staff finally embarked on the logical path of perusing the relevant patents. While the following explanation of Visitronic's operation relies to a certain extent on the educated guesses of Technical Consultant Bennett Sherman, we're reasonably sure he's at least barking up the right circuits.



**Honeywell's Visitronic System?** One possibility is this rangefinder-type configuration in which a small auxiliary lens (A) forms an image on an array of photocells (C). Another lens (B) in a moving holder forms an identical image on the second array of photocells (C). The photocells are interconnected to a control center (D), which sends electrical signals to the moving auxiliary-lens motor drive and the main camera lens drive (E). When the images formed by the auxiliary lenses are in exactly the same position in front of both photocell arrays, the focus drive is stopped and the main camera lens (F) (hopefully) produces a sharp image on the film (G).

A reading of Stauffer and Towne's patents (on which Honeywell's Visitronic Auto Focus schemes may be based) indicates that the principles of the new autofocus method are somewhat different from what's been tried before. However, the electronic systems are relatively straightforward. The main secret seems to be in the use of arrays of tiny light cells—probably silicon cells—to sense detail in the image. These tiny cells are interconnected in such a way that variations in the general light of the object, or in the response of individual cells, have no effect on the autofocus action. Since autofocus devices must "fit into a camera," they

are operated by batteries. The interconnections between cells also insure that battery-voltage changes have little effect on the detection of image details.

One of the schemes (see diagram, this page) uses two auxiliary lenses: one stationary, the other moving and mechanically connected to the camera lens. When the moving lens forms an image on part of the cell array which matches an image formed by the stationary lens on the other part of the cell array, the "focus" is found. This "comparator method" is simply a photoelectric equivalent of the rangefinder with its two images made to match up in the camera's viewfinder.

Another possible arrangement uses the SLR's camera lens itself to form and focus the image, with the two cell arrays near each other and each just slightly out of focus. When the image details are blurred equally on each cell array, the focus is detected—it's actually about halfway between the two cell arrays.

With modern silicon cells, which can be made as small as 1/1000 in. in width and lined up in arrays, and with today's miniature integrated electronic circuits to control and sort out the signals from each of the cells in the arrays, either of these autofocus techniques clearly becomes possible. RCA and Fairchild Camera have been experimenting for several years with complete TV-picture detector arrays made of many thousands of tiny silicon cells. The application of silicon-cell arrays to autofocus is, therefore, quite practical. However, just as the human eye can be fooled, even these novel electronic image-detail detectors offered by Honeywell will suffer in focusing accuracy when the subject has low contrast or shows only very soft details.

Perhaps it's all just one more step toward the miniaturized, computerized, all-electronic camera. Today's technology is certainly equal to this task.

## Another 110 SLR with zoom

We thought we had heard of all the camera makers rumored to be or actually working on 110 SLR cameras—Canon, Nikon, Minolta. Now we've heard of another, a major manufacturer who has been making nothing but SLR cameras. The new camera design is most unusual. Instead of the lens being in front of the film, the lens is at one end of the camera and the finder's at the other end with the film positioned along the right side. The built-in zoom lens elements are in two parts—a folded zoom design. Present drawings indicate the size will be about the same as the Kodak Pocket Instamatic 48 or 60. Speed of the lens or the shutter is not known. Delivery? After Photokina in 1977, maybe.

## Sigma joins internal-focusing group

Canon isn't the only company with a compact, light, internal-focusing tele. Sigma's yet-to-be-released-in-the-U.S. 200mm f/3.5 XQ lens has six elements, including a rear focusing group with aberration-correcting floating elements. The 4 1/2-in.-long lens focuses to 33 in., or 1:3 magnification! A unique feature: a fast-moving main focusing ring provides focusing from infinity to 33 in.; a second auxiliary focusing ring provides finer focusing from infinity down to 7 ft.

Continued on page 150



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| FTB-N w/11.2 SSC     | \$319.50 |
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| EF w/11.8 SC         | \$319.50 |
| EF w/11.4 SSC        | \$359.50 |
| EF w/11.2 SSC        | \$424.50 |
| F1 w/11.8 SC         | \$369.50 |
| F1 w/11.4 SSC        | \$409.50 |
| F1 w/11.2 SSC        | \$474.50 |
| FTB-N Body Only      | \$169.50 |
| EF Body Only         | \$289.50 |
| F1 Body Only         | \$329.50 |
| 110ED w/flash        | \$104.50 |
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| Cases for F1 or EF   | \$ 19.50 |

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| Auto 200mm 13.5 MC lens    |          |
| Braun 178 Flash Gadget Bag |          |
| 1A filter Lens Shade       |          |
| Auto 2x teleconverter      |          |
| Cable release Blower Brush |          |
| COMPLETE OUTFIT            | \$315.50 |
| For 11.4 SSC Add           | \$ 40.00 |
| For Black Add              | \$ 10.00 |

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| FT2 w/11.2 IC  | \$364.50 |
| EL w/12.0 IC   | \$352.50 |
| EL w/11.4 IC   | \$419.50 |
| EL w/11.2 IC   | \$472.50 |
| FT2 Body Only  | \$167.50 |
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| Black Body Add | \$ 10.00 |

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## NIKOR LENSES

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|--------------------|----------|
| 16mm 13.5 Fish-Eye | \$385.00 |
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| 24mm 12.8 IC       | \$184.95 |
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| 28mm 12.8 IC       | \$184.75 |
| 35mm 13.5 IC       | \$161.65 |
| 35mm 12.8 IC       | \$128.75 |
| 35mm 12.0 IC       | \$181.50 |
| 35mm 11.4 IC       | \$309.50 |
| 55mm 13.5 IC       | \$186.95 |
| 85mm 11.8 IC       | \$193.50 |
| 105mm 12.5 IC      | \$193.50 |
| 135mm 13.5 IC      | \$145.50 |
| 135mm 12.8 IC      | \$185.50 |
| 180mm 12.8 IC      | \$386.95 |
| 200mm 14.0 IC      | \$193.50 |
| 300mm 14.5 IC      | \$312.95 |
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| SRT 201 w/11.2             | \$298.50 |
| SRT 201 Body Only          | \$155.50 |
| SRT 202 w/11.7             | \$255.50 |
| SRT 202 w/11.4             | \$282.95 |
| SRT 202 w/11.2             | \$328.50 |
| SRT 202 Body Only          | \$185.50 |
| For Black Add              | \$ 10.00 |
| XE-5 w/11.7                | \$312.75 |
| XE-5 w/11.4                | \$339.50 |
| XE-5 w/11.2                | \$392.50 |
| XE-5 Body Only             | \$249.50 |
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| XE-7 w/11.4                | \$389.25 |
| XE-7 w/11.2                | \$434.95 |
| XE-7 Body Only             | \$289.50 |
| KK w/AE & 11.7             | \$424.50 |
| KK w/AE & 11.4             | \$449.50 |
| KK w/AE & 11.2             | \$489.50 |
| KK w/AE Body               | \$359.50 |
| SRT Case                   | \$ 18.00 |
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| Case For XE-7              | \$ 29.95 |
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| 28mm 12.5 w/shade  | \$147.25 |
| 28mm 12.8 w/shade  | \$121.75 |
| 28mm 13.5 w/shade  | \$108.95 |
| 35mm 11.8 w/shade  | \$147.25 |
| 35mm 12.8 w/shade  | \$ 83.50 |
| 50mm 13.5 Macro    | \$153.75 |
| 100mm 13.5 Macro   | \$256.00 |
| 85mm 11.7 w/shade  | \$159.95 |
| 100mm 12.5 w/shade | \$128.00 |
| 135mm 12.8 w/shade | \$115.50 |
| 135mm 13.5 w/shade | \$ 83.50 |
| 200mm 13.5 w/shade | \$159.95 |
| 300mm 14.5 w/shade | \$236.50 |
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| Canon A21014 w/cs | \$489.95 |
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| GAF SS250 XL Zm     | \$219.50 |
| GAF SS505 XL        | \$363.00 |
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|---------------------|----------|
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| f/Konica FD                            | \$44.95 |
| f/1.1 Slide Dupl. (T-rt)               | \$17.88 |
| Zoom Slide Dupl. (T-rt)                | \$37.95 |
| Series VII Slide Dupl. f/bellows       | \$11.95 |

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|                                        |         |
|----------------------------------------|---------|
| Multiple Image Lenses (specify size)   | \$11.99 |
| Specify:                               |         |
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| 3-image triangle                       |         |
| 5-image concentric                     |         |
| 5-image Step-Vue                       |         |
| Adjustable Spot vignetter*             | \$18.99 |
| Magik-Pix Dual Trick Attach*           | \$11.95 |
| SpectralColor Tricolor set*            | \$13.95 |
| Ultraview Macro (series VII)           | \$18.95 |
| Ultrawide Flashing Attach (series VII) | \$29.95 |
| Right Angle Candler (series VII)       | \$12.95 |
| Specify to Yellow 1/2" x 1"            |         |
| 1/2 Skyline 1/2" x 1"                  |         |
| 1/2 ND2 1/2" x 1"                      |         |
| *Specify filter size.                  |         |

#### LENS AND FILTER ADAPTERS

|                       |        |
|-----------------------|--------|
| Series Adapter Rings: |        |
| V (27-30.5mm)         | \$3.95 |
| VI (34-43mm)          | \$4.50 |
| VII (46-55mm)         | \$5.95 |
| VIII (58mm)           | \$6.50 |
| VII f/Hasselblad      | \$9.95 |
| VIII (55-58mm)        | \$6.95 |
| VIII (62-67mm)        | \$9.95 |

#### LENS ACCESSORIES

|                                  |        |
|----------------------------------|--------|
| Collapsible Rubber Hoods:        |        |
| 28mm-55mm (specify)              | \$2.95 |
| 55mm-67mm (specify)              | \$3.95 |
| 72mm                             | \$4.95 |
| Metal Deluxe Body Caps:          |        |
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| f/Nikon                          | \$2.25 |
| f/Minolta                        | \$2.25 |
| f/Konica                         | \$2.50 |
| f/Miranda                        | \$2.25 |
| Metal Deluxe Rear Lens Caps:     |        |
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| f/Canon                          | \$2.50 |
| f/Minolta                        | \$2.50 |
| f/Konica                         | \$2.50 |
| f/Nikon                          | \$3.95 |
| Metal Deluxe Screw-in Lens Caps: |        |
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| 62mm-67mm                        | \$2.99 |

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| 18mm 2.2 Ultrawide                                                 | \$124.95 |
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| 300mm 4.0 Hi-Speed Macro                                           | \$157.50 |
| 80-200mm 5.5 Macro Zoom                                            | \$199.50 |
| 300mm B.O. Reflex Mirror Tele.                                     | \$124.95 |

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|                     |        |
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| f/85-135mm          | \$2.75 |
| f/200-250mm         | \$2.99 |
| Deluxe Hard Cases:  |        |
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| f/Minolta       | \$24.95 |
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| Quantaray Uni-Touch 35/24x24 | \$59.95  |
| 2-Gem 66 35/24x24            | \$84.95  |
| Color-Gem 35/24x34           | \$139.95 |

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SEE RITZ CAMERA AD ON PAGE 51



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## KEPPLER ON THE SLR

Continued from page 36

How accurate is the new OM-2 metering system? Can it really give you correct exposure readings right from the shutter and film surface itself despite the fact that film surfaces vary in reflection and color?

We hope to have a test sample in our hands within the next few months so we can check the metering system and camera thoroughly. (However, we do not advise would-be buyers with a desire to be the first on their block with an OM-2 to buy one in Japan. The U.S. models may be altered.)

You might very well wonder why Maitani has developed such a different exposure system. Actually, there are two reasons: the first, and probably least important, is practical business. Asahi Optical Co., the Pentax maker, owns the patents for the so-called memory hold used in every full-aperture-metering automatic SLR in which you set the aperture and the camera sets the shutter speed. This memory hold "remembers" the exposure measured before the shutter is released and "holds" it until the mirror moves upwards and the shutter actually starts to operate. Many SLR companies are paying Asahi for the rights to use this patent. Since the Olympus OM-1 measures light after the mirror moves upward, it needs no memory hold and no patent payments.

In more practical terms, the new Olympus system provides metering at the technically most advantageous place—directly in front of the film—or, during exposure, right from the film itself. In addition, the Olympus OM-2 system provides the utmost flexibility in exposure accuracy by being able to adjust during the exposure itself—the only SLR so capable.

Along with the OM-2, Olympus exhibited a new nicad 5-hr. rechargeable flat battery pack which fits horizontally under the Olympus motor drive and furnishes power for at least 40 rolls of film. With its motor

## LENS LIGHT FALLOFF

Continued from page 92

can see just how this graph appears when it comes off our recorder. However, to make the graph easier for you to read, in our lens tests we will redraw it for both maximum aperture and f/5.6, giving you the number of f/stops of light loss from the center to the corner at these two apertures. Our maximum allowable tolerances are as follows:

Light falloff at the extreme corners of the picture should be not more than one full stop compared to the light at the picture center at f/5.6 or smaller apertures.

Regrettably, we cannot fix for all lenses what the light falloff should be at maximum aperture. There is simply too much variation in what to expect from wide-angle lenses, high-speed lenses, zooms, mirror lenses, etc. And the cosine fourth law further prevents laying down meaningful maximum-aperture limits.

How do these items relate in various

drive and this new flat battery pack, the Olympus OM-1, or OM-2, is just about as large and heavy as most other 35mm SLR cameras with no motor drive at all!



**Alternative motor power pack:** Rather have a compact nicad pack instead of the vertical AA-cell pistol grip?

Besides the standard Motor Drive, Olympus has a new single-shot, super-compact, moderately-priced Motor Drive 2 powered by four 1.5-volt AA cells providing power for 50 rolls of 36-exposure film.



**Simplified motor:** MD-2 uses four AA cells, offers single shots only, will be far less expensive than other motors.

Our initial reaction to the OM-2: brilliant, creative engineering has produced a superbly finished fully automatic SLR which inevitably must have as much impact on the photographic scene as the introduction of the OM-1 itself. —THE END

kinds of lenses: a picture of the sky such as you might shoot, a vignetting test we've already described, and our new way of actually grappling with total light falloff? We have taken a number of different types of lenses from wide-angle to tele (including zoom) and gone through each test with them (see pages 90-93). We think you'll find them as fascinating as we did.

With our new tests for light falloff and our simplified charts and tables for other lens and camera test measurements which you'll find in "Modern Tests" beginning with this month, we feel we have taken significant steps not only in giving you more information on cameras and lenses than you ever had before, but also in presenting it all in an easier-to-assimilate manner.

Are we finished? Heavens no. There are plenty of other lens and camera characteristics we want to tell you about each month. We believe MODERN's readers have a right to know, and we won't stop until you know it all. —THE END



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28/2.8.....149.50 135/3.5.....104.50

28/3.5.....128.50 135/2.5.....149.50

35/3.5.....76.50 200/4.0.....156.95

35/2.....158.50 200/5.6.....224.95

85/1.8.....149.50 300/5.6.....224.95

35-70/2.8 Zoom.....429.50

100-200/5.6 Zoom.....169.50

50/1.5 Macro.....145.95

Speedlite 1312 2/Flash Auto

Ring A2B 2.....45.95

Waist Finder.....28.50

Angle Finder A-2.....35.50

Focusing Screen A.....19.95

Screen II or Split Image.....19.75

All Brand

New Latest

814E

Auto Macro

Zoom

Electronic

Outfit

w/7.5-60/11.4 lens.....298.75

Canon AE 1014 Electronic w/

7.5-60/11.4 lens and remote

switch 60 in case.....459.50

CANON Low Light Super 8's

Canon 512XL Super-8.....249.50

514XL (5.1 cm f1.4).....192.50

310XL (3.1 cm f1.0).....139.50

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CAMERAS, LENSES,

FLASHES & ACCESSORIES

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Vivitar SLR

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## BRAND NEW CALCULATORS!



### TEXAS INSTRUMENTS & OTHERS

|                                                        |        |
|--------------------------------------------------------|--------|
| TI-SR11                                                | 34.95  |
| TI-SR10                                                | 27.95  |
| TI-SR51A                                               | 127.95 |
| TI-SR50A                                               | 79.95  |
| UNISONIC 12 DIGIT                                      | 37.95  |
| TI 1200                                                | 17.95  |
| BOWMAR MX 100                                          | 43.50  |
| BOWMAR MX 140                                          | 48.95  |
| MELCOR 400                                             | 26.00  |
| MELCOR 440                                             | 27.95  |
| Remington Mini Printer                                 | 74.50  |
| 25 tapes for mini-prt                                  | 10.00  |
| BOWMAR desk                                            | 26.50  |
| TI Exacra 31 desk                                      | 25.88  |
| 14250                                                  | 142.50 |
| HERMES Admin. with Memory                              | 21.50  |
| AC adapter for most calculators                        | 9.99   |
| TI-1500                                                | 34.95  |
| TI-1250                                                | 19.95  |
| MELCOR 590 slide rule                                  | 27.50  |
| HEWLETT PACKARD 21                                     | 121.95 |
| COMPUCHRON LED                                         |        |
| Ladies' digital watch                                  | 74.95  |
| H&M QUANTUM Digital Watch circuitry by Hughes Aircraft | 64.95  |
| COMPUCHRON LED                                         |        |
| Digital watch                                          | 74.95  |
| GOLD MEDALIST FLEXOMATIC 110/220V shaver by Schick     |        |
| in leatherette travel case                             | 21.95  |

All subject to model & price change & availability

## 3 LENS MONEY-SAVER SLR KITS! NEW



YES YOUR FAVORITE SLR with 3 PRIME INTERCHANGEABLE SLR LENSES! • OUTFITS Below Include: • Your favorite SLR • Automatic normal lens • Hi-Quality 35/35 Wide Angle Lens • High Quality Telephoto 135/3.5

|                              |        |
|------------------------------|--------|
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| Fujica 801-1.8 KIT           | 254.95 |
| Nikkomat FT2 12 KIT          | 289.95 |
| Canon FT-1.8 KIT             | 434.95 |
| Konica A3 1.7 KIT            | 269.95 |
| Minolta 201 1.7 KIT          | 283.95 |
| Pentax ESII 12 KIT           | 349.95 |
| Yashica AX 1.7 KIT           | 208.95 |
| Miranda Sensorex EE 1.8 KIT  | 214.95 |
| Minolta SRT 202 12 KIT       | 234.95 |
| Minolta SRT 202 12.4 KIT     | 336.95 |
| Minolta XE5 11.7 KIT         | 364.95 |
| Canon FTBN 1.8 KIT           | 249.95 |
| Praktica LLC 1.8 KIT         | 174.95 |
| Praktica LTL 1.8 KIT         | 157.95 |
| Konica T3-N 1.7 KIT          | 344.95 |
| Petri FTEE 1.8 KIT           | 194.50 |
| Mamiya DSX 1000 12 KIT       | 229.95 |
| Pentax SP 1000 12 KIT        | 199.95 |
| Olympus OM-1-MD 1.8 KIT      | 319.95 |
| Cosmore 12 KIT               | 134.95 |
| LTL-S-Black Praktica 1.8 KIT | 169.95 |
| Canon TX 1.8 KIT             | 244.95 |
| Fujica ST 701-1.8 KIT        | 199.95 |
| Petri FTX 1.8 KIT            | 189.95 |

## NEW AUTOMATIC SIGMA "XO"

|                             |             |               |        |
|-----------------------------|-------------|---------------|--------|
| 18/2.8                      | 157.89      | 100/2.8 macro | 119.89 |
| 18/2.2                      | 129.89      | 135/2.8 macro | 99.89  |
| 35/2.8                      | 104.89      | 135/1.8       | 133.89 |
| 38/2.8                      | 79.89       | 200/2.8 macro | 154.89 |
| 35/2.8 Auto                 | 200/4 macro | 134.89        |        |
| Flash                       | 72.89       | 300/4 macro   | 157.89 |
| 55/2.8 macro                | 96.89       | 400/5.6       | 123.75 |
| 10-50/3.5 Auto Zoom Macro   |             |               | 127.85 |
| 70/230/4.5 Auto Macro Zoom  |             |               | 169.89 |
| 80-200/3.5 Auto Macro       |             |               | 198.95 |
| 120-300/5.6 Auto Macro Zoom |             |               | 219.95 |
| 300/5.6 Sigma Mirror Lens   |             |               | 128.95 |
| 300/4.5 Sigma Mirror Lens   |             |               | 425.00 |

## NEW TAMRON

### NEW TAMRON ADAPTAL SYSTEM

|                            |       |         |        |
|----------------------------|-------|---------|--------|
| 28/2.8                     | 76.95 | 200/3.5 |        |
| 105/2.5                    | 83.50 | w/flash | 104.50 |
| 135/2.8                    | 67.95 | w/flash | 113.95 |
| 35-100/3.5 Auto Macro Zoom |       |         | 274.95 |
| 70-150/3.8 Auto Zoom       |       |         | 118.95 |
| 70-200/3.8 Auto Zoom       |       |         | 164.95 |
| 70-350/4.5 Auto Zoom       |       |         | 369.95 |
| 80-200/3.8 Auto Zoom       |       |         | 229.95 |
| 85-210/4.5 Auto Zoom       |       |         | 136.95 |
| 200-500/5.6 Auto Zoom      |       |         | 377.95 |

### NEW AUTOMATIC TAMRON F SYSTEM

|        |       |         |       |
|--------|-------|---------|-------|
| 28/2.8 | 97.95 | 135/2.8 | 59.95 |
| 35/2.8 | 57.95 | 200/3.5 | 74.95 |

## AUTO AETNA ROKUNAR

|                                   |       |         |        |
|-----------------------------------|-------|---------|--------|
| 21/3.8                            | 89.50 | 135/1.8 | 129.50 |
| 28/2.8                            | 59.95 | 200/3.5 | 69.95  |
| 35/2.8                            | 39.95 | 300/5.5 | 79.95  |
| 85/1.7                            | 97.50 | 400/6.3 | 87.95  |
| 135/2.8                           | 49.95 | w/flash | 182.95 |
| 35-90/3.5 Auto Macro Multi Coated |       |         | 182.95 |
| 60-135/3.5 Auto Multi Coated      |       |         | 119.95 |
| 60-150/4 Auto Macro Multi         |       |         | 174.95 |
| 70-210/4 Auto Zoom                |       |         | 129.50 |
| 85-210/4.5 Auto Multi Coated      |       |         | 144.95 |
| 180-410/5.6 Press Zoom            |       |         | 167.95 |

## VIVITAR

### NEW SERIES 1 VIVITAR

|                                    |        |
|------------------------------------|--------|
| 35-85/2.8 Multicoated              | 279.95 |
| 70-210/3.5 Auto Macro Multi Coated | 274.50 |
| 70-210/3.5 Macro Multicoated       | 293.95 |
| 135/2.3                            | 127.95 |
| 200/3                              | 144.95 |

### NEW VIVITAR AUTOMATIC

|                                           |       |         |        |
|-------------------------------------------|-------|---------|--------|
| For FX & MIN. Other SLR mounts add \$5.00 |       |         |        |
| 20/3.8                                    | 81.95 | 100/2.8 | 51.95  |
| 24/2.8                                    | 92.95 | w/shade |        |
| 28/2.5                                    | 79.95 | 135/2.8 |        |
| 35/2.8                                    | 59.95 | w/shade | 56.95  |
| 35/1.9                                    | 67.50 | 200/3.5 | 68.95  |
| 300/5.6 w/shade                           |       |         | 97.50  |
| 55/2.8 Macro                              |       |         | 94.95  |
| 400/5.6 with shade                        |       |         | 145.76 |
| 85-205/3.8 Auto Macro w/shade             |       |         | 152.95 |
| 75-260/4.5 Auto w/shade                   |       |         | 148.50 |

### NEW VIVITAR TX AUTOMATIC

|                            |       |         |        |
|----------------------------|-------|---------|--------|
| 24/2.8                     | 84.83 | 135/2.5 | 65.81  |
| 28/2.2                     | 74.83 | 200/3.5 | 77.81  |
| 35/2.5                     | 62.81 | 300/5.6 | 84.83  |
| 40/2.8 with shade          |       |         | 133.85 |
| 90-230/4.5 Zoom with shade |       |         | 129.29 |
| 75-260/4.5 Zoom with shade |       |         | 148.55 |

Adapters extra on Preset, Tamron, T4, TX and Ys Lenses For Most SLR's

|                           |          |
|---------------------------|----------|
| T4 or T2 Mount            | 94.395   |
| T4 Auto Tamron Mounts ea. | 9.95     |
| Ys, TX, Mounts            | 84.17.95 |

## FUJICA ST-801 2-LENS KIT

Camera, 50/1.8 Fuji, 135/3.5 Famous Tele, B.C. Flashgun

|        |     |
|--------|-----|
| 244.95 | New |
|--------|-----|

## PENTAX 'ES' II 2 Auto LENS KIT

|                                                        |        |
|--------------------------------------------------------|--------|
| Camera, 55/12 'SMC' Takumar, 135/3.5 Famous Auto Tele. | 364.95 |
|--------------------------------------------------------|--------|

## YASHICA MAT 124 G

PRO KIT • Camera • Case, Filter, Sunshade • Wide Pro Strap • Extra Metal Wrist Strap

|        |     |
|--------|-----|
| 132.95 | New |
|--------|-----|

## YASHICA ELECTRO 35

|                                          |        |
|------------------------------------------|--------|
| 35 S/N 1 With Case, Flash, Shade, Filter | 104.95 |
|------------------------------------------|--------|

## HALLIBURTON ALUMINUM CASE

|                    |       |
|--------------------|-------|
| MODEL 100 12x9.5   | 47.95 |
| MODEL 101 10x9.5   | 49.95 |
| MODEL 102 10x13x14 | 51.95 |
| MODEL 103 10x13x6  | 53.95 |
| MODEL 105 21x13x6  | 88.50 |
| MODEL 106 21x17x7  | 74.95 |
| MODEL 110 28x18x5  | 81.50 |
| MODEL 111 24x18x7  | 85.95 |

The Halliburton Aluminum cases are available in Silver or Black finish, when ordering please specify.



## NEW! Latest! NIKON F2 PHOTOMIC

Nikon F2 Photomic Camera 50mm F2 auto Nikkor lens 135mm F3.5 Telephoto w/case 35mm 35/3.5 with case Compartment case Above equip. with F1.4 instead of F2

509.95 Add 51.95



## SP1000 KIT with 3 Auto Lenses

Honeywell Spotmatic F Camera F2 SMC Takumar 35mm f2.8 auto with case 135mm f2.8 Auto with case Eveready case for camera Auto Extension Tube Set

## BRAND NEW LATEST 6 PC. NIKKORMAT FT2 OUTFIT

• Nikkormat FT2 (K Screen) f2 • Eveready carrying case • Skylight Filter • 135/3.5 Telephoto w/case

|        |     |
|--------|-----|
| 314.95 | New |
|--------|-----|

with Nikkormat EL instead of FT2 add .....100.00

## BRAND NEW NIKKORMAT EL

### 2-AUTO LENS OUTFIT WITH FLASH

• New Nikkormat 'FTN'-11 Camera • New 50/2.8 Auto Nikkor • New 26/2.8 Famous Auto W.A. • New Famous B.C. Flashgun

|        |     |
|--------|-----|
| 397.95 | New |
|--------|-----|

## ALL NEW MINOLTA SRT 100 OUTFIT

Minolta SRT 100 f2 w/case 35mm F2.8 Auto M.C. w/case 135/2.8 Auto M.C. Tele w/case

|        |     |
|--------|-----|
| 244.95 | New |
|--------|-----|

COMPLETE with SRT 101 F1.7 instead of 100 add .....\$40.00



## MAMIYA/SEKOR 7-PIECE OUTFITS

|                                                                                                           |        |
|-----------------------------------------------------------------------------------------------------------|--------|
| MBK 500 12 lens, 135 f2.8 Auto w/28 f2.8 Auto, 2X Tele Auto, Cone, Electronic Flash, Sun Shade, 1A Filter | 204.95 |
| Same Outfit with DSX 500, 12 lens                                                                         | 219.95 |
| Same Outfit with DSX 1000, 11.8 lens                                                                      | 229.95 |
| Same Outfit with DSX 1000, 11.4 lens                                                                      | 249.95 |

## BRAND NEW Compact 35mm SLR OLYMPUS OM-1 MD 2-LENS CAMERA OUTFIT

Buy the Outfit and Save . . .

|        |     |
|--------|-----|
| 345.00 | New |
|--------|-----|

Includes: • Olympus OM-1 MD Body • 50mm f/1.8 Auto ZUIKO • 135mm f/2.8 Auto Lens • Eveready Case with 50mm 1.4 \$40.00 Additional

## NEW LATEST CANON FTBN OUTFIT

Canon FTB Reflex 50mm F1.8 Auto Canon Leather eveready case 135mm F2.8 auto. Telephoto Lensshade Complete

|        |     |
|--------|-----|
| 259.95 | New |
|--------|-----|

## ALL BRAND NEW 35mm COMPACT 6-Piece Travel Outfits

Includes Camera, Case, Electronic Flash, Metal Wrist Strap, Gadget Bag and Lens Brush.

|        |     |
|--------|-----|
| 119.95 | New |
|--------|-----|

Canonet G111 f1.7 .....99.95 Yashica GSN f1.7 .....94.50 Olympus RC .....124.95 Ricoh 500 G .....89.95 BONUS: Auxiliary Telephoto & Wide Angle Lens Set w/above .....27.95

## BRAND NEW MIRANDA SENSOREX EE

### 2 LENS OUTFIT WITH FLASH

|        |     |
|--------|-----|
| 199.95 | New |
|--------|-----|

• Miranda Sensorex 'EE' Camera • B-T-L Metal • Pentax Prism Finder • 50/1.8 Auto Miranda Lens • 135/3.5 Telephoto Lens • B.C. Flashgun

## BRAND NEW 7 PIECE KONICA A-3 OUTFIT

• Konica A3 Reflex camera • 50mm F1.7 Auto Hexanon • Case • 135/2.8 Auto EE Tele • Case for Lens • Sunshade for 50mm • Skylight Filter

|        |     |
|--------|-----|
| 259.95 | New |
|--------|-----|

with Konica 'H'-T3 instead of A3 add .....89.95 Bonus—Access Shoe (with T3 only)

## Min. SRT-101 14 pc. Outfit



### Minolta SRT-201 w/1.7 Rokkor X electronic flash

135mm F2.8 MC Auto telephoto Carry all gadget bag Cable—shade—filter Body and rear Caps brush—wrist strap lens tissue Minolta Guide Book.....

|        |     |
|--------|-----|
| 299.95 | New |
|--------|-----|

with F1.4 lens instead add .....29.00 with F1.2 add total of .....78.00 Same outfit w/SRT 100 .....deduct 35.00

## MINOLTA SRT THREE LENS KITS!

MINOLTA SRT 200-42 Auto MC Rokkor X and two of these lenses: 35mm f2.8, 135mm f2.8 fully Auto meter coupled lenses & 2X Auto Converter

|        |     |
|--------|-----|
| 249.50 | New |
|--------|-----|

MINOLTA SRT 201 Same Outfit .....314.50 MINOLTA SRT 100 Same Outfit .....234.95 MINOLTA SRT 201 with 50mm 11.4 Auto MC Rokkor X same outfit as above .....329.95 For 28 f2.8 instead of 35 in outfit add .....10.00

## ALL BRAND NEW MINOLTA SR-T 201 2 lens kits and other MIN. KITS

Minolta SRT 201 with 50mm 11.7 Auto MC Rokkor X with choice of any one of the lenses listed below:

|                                                                                                |        |
|------------------------------------------------------------------------------------------------|--------|
| 35 f2.8, 135/2.8 fully Auto Meter coupled Lenses w/c electronic flash and 2X Auto MC Converter | 289.50 |
|------------------------------------------------------------------------------------------------|--------|

MINOLTA SRT 100 12 Same Outfit .....219.50 MINOLTA SRT 201 with 50mm 11.4 Auto MC Rokkor X same outfit as above .....309.95 MINOLTA SRT 102 with 50mm 11.2 Auto MC Rokkor same outfit .....389.95

## FOR ONE ADDITIONAL LENS, ADD \$49.50

28mm f2.8 instead of 35mm f2.8 add .....\$10.00 MIN. XE 5-1.7, same kit .....364.95 MIN. XE 7-1.7, same kit .....409.95 MIN. SRT 200 f2, same kit .....242.95 MIN. SRT 202-1.7, same kit .....299.95

## NEW BARGAIN RIOT!

• 135/2.8 MC Rokkor .....93.50 • 135/3.5 MC Rokkor .....64.50 • 135/2.8 Auto Mamiya SX .....59.50 • Minox BL w/c .....109.95 • Mir SEX EE 1.8 w/c .....174.95 • Mir SEX EE 1.4 w/c .....197.95 • Eumig 6100 Projector .....129.95

## • USED SPECIAL KONICA AUTO REFLEX T2 Body only

.....119.95

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## HONEYWELL PENTAX!

|                          |        |
|--------------------------|--------|
| * PENTAX SPOTMATIC F-1.8 | 209.95 |
| * PENTAX ES II 12        | 339.95 |
| * PENTAX KM body         | 169.95 |
| * PENTAX KX body         | 203.95 |
| * PENTAX K2 body         | 203.95 |
| * PENTAX MOTOR DRIVE     | 339.50 |
| * PENTAX KM-1.8          | 249.95 |
| * PENTAX KM-1.4          | 284.95 |
| * PENTAX KX-1.8          | 329.01 |
| * PENTAX K-2-1.8         | 384.95 |
| * PENTAX K2-1.4          | 419.95 |

## BRAND NEW CONVERTERS

|                               |       |
|-------------------------------|-------|
| 2X Automatic With Case        | 15.99 |
| 3X Automatic With Case        | 22.50 |
| 2X & 3X Auto Converter w/Case | 39.99 |

SPECIAL MODEL CONVERTERS

Automatic converters for most models of Canon-SLR, Topcon, Konica, Petri V, 6, 7 FT, FTEE, Minolta SRT-101 & Nikon & Nikomat meter coupled models. Olympus-Pen-F-PV, FT, Topcon Auto 100 (2X only), Zeiss Ikon.

|                   |       |
|-------------------|-------|
| 2X AUTO with case | 24.99 |
| 3X AUTO with case | 29.99 |

## NEW HANIMEX PRAKTIKA LLC

|                                                       |        |
|-------------------------------------------------------|--------|
| With 50/1.8 Fully Automatic Meyer Lens with case      | 124.95 |
| HANIMEX PRAKTIKA LTL 50/1.8 Fully Automatic with case | 108.50 |

## HANIMEX PRAKTIKA-TL SUPER

|                                                                                                                             |        |
|-----------------------------------------------------------------------------------------------------------------------------|--------|
| Outfit With 50/1.8 Fully Auto Meyer With Deluxe Case, Thru The Lens Meter System, Sun Shade, and an Auto Extension Tube Set | 107.95 |
|-----------------------------------------------------------------------------------------------------------------------------|--------|

## SAME OUTFIT

|                           |        |
|---------------------------|--------|
| With HANIMEX PRAKTIKA LTL | 139.50 |
| With HANIMEX PRAKTIKA TL  | 157.50 |

## HANIMEX PRAKTIKA TL OUTFIT

|                                                                                          |        |
|------------------------------------------------------------------------------------------|--------|
| With 50/1.8 Automatic Lens, Camera Everyday Case, 135/2.8 Fully Automatic Lens and Shade | 137.50 |
| Same outfit as above but with Hanimelex Praktika LTL                                     | 157.50 |

## New Quality Accessories for Most Praktikas

|                                    |        |
|------------------------------------|--------|
| 135/3.5 or 35/3.5 lens             | 21.95  |
| 85/205-3.8 Famous Auto             | 109.95 |
| Rubber Eye Cup                     | 6.95   |
| Screen in Polarizer                | 9.95   |
| Reversing Ring                     | 4.95   |
| Deluxe Case                        | 8.95   |
| Extension Bellows                  | 16.95  |
| Automatic Bellows                  | 39.95  |
| Automatic Dual Track Bellows       | 99.50  |
| Extension Tube Set                 | 6.95   |
| Automatic Extension Tube Set       | 9.95   |
| Variable Close-Up Lens +2 to +10   | 15.95  |
| Screw-In Filters & Shutter Release | 4.95   |
| 2X Auto Teleconverter w/case       | 15.95  |
| 3X Auto Teleconverter w/case       | 22.50  |
| 1:1 Slide Duplicator               | 16.95  |
| Microscope Adapter                 | 15.95  |

## ALL BRAND NEW 10 PIECE MINI SLR DREAM OUTFIT

All brand new SLR's listed below include the 10-piece custom fitted outfit underneath, just PICK YOUR FAVORITE SLR and get a complete matched, 10-piece outfit included with it at the same low price.

| Your favorite SLR Camera (see listing below) | Camera, Everyday Case, Electronic Flash, Sunshade | Aux. Telephoto Lens, Aux. Wide Angle Lens, Case for Lenses, Cable Release, Screw In Filter |
|----------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------|
| MAMIYA BEKOR 500 MSX 50/2 Auto Sekor         | 199.95                                            |                                                                                            |
| MAMIYA BEKOR DSK 1000 55/1.8 Auto Mamiya SX  | 219.95                                            |                                                                                            |
| Petri FTEE 55/1.8 Auto Petri                 | 209.50                                            |                                                                                            |
| MIRANDA SENSOREE EE 50/1.8 Auto MIRANDA      | 219.95                                            |                                                                                            |
| HANIMEX PRAKTIKA LTL 50/1.8 ORESTON          | 149.50                                            |                                                                                            |
| KONICA AUTO REFLEX "N"-T3 50/1.7 Auto        | 349.95                                            |                                                                                            |
| Pentax ESII 12                               | 369.95                                            |                                                                                            |
| Fujica 901 1.4 EBC                           | 269.95                                            |                                                                                            |
| Fujica 901 1.8 Auto                          | 324.95                                            |                                                                                            |
| Fujica ST 701 50/1.8 Auto FUJINON New model  | 219.95                                            |                                                                                            |
| Fujica ST801 50/1.8 EBC FUJINON              | 264.95                                            |                                                                                            |
| RICOH SINGLEX 55/2 Auto RIKON                | 179.95                                            |                                                                                            |
| Fujica 901 1.4 EBC Auto                      | 384.95                                            |                                                                                            |
| Minolta SRT 100 55/1.2 MC ROKKOR X           | 199.95                                            |                                                                                            |
| Minolta SRT 201 55/1.7 Auto MC ROKKOR        | 269.95                                            |                                                                                            |
| Minolta SRT 102 58/1.2 MC ROKKOR             | 339.95                                            |                                                                                            |
| Honeywell Spotmatic F55/1.8 Auto             | 249.95                                            |                                                                                            |
| CANON FTB 50/1.8 Auto CANON FDSC             | 259.95                                            |                                                                                            |
| CANON F1 50/1.8 Auto CANON FDSC              | 424.95                                            |                                                                                            |
| CANON TLE 50/1.8 Auto CANON FDSC             | 219.95                                            |                                                                                            |
| NIKON Photomic FTN 50/2 Auto IC NIKKOR       | 419.50                                            |                                                                                            |
| Nikkormat EL 50/2 Auto Nikkor                | 449.50                                            |                                                                                            |
| MAMIYA/SEKOR 1000 MSX 55/1.8 Auto Sekor      | 209.95                                            |                                                                                            |
| Miranda Sensoree EE1.4                       | 254.95                                            |                                                                                            |
| Konica A3 1.7 Auto                           | 249.95                                            |                                                                                            |
| Minolta XE 1.7 Auto                          | 419.95                                            |                                                                                            |
| Canon TX 1.8                                 | 229.95                                            |                                                                                            |

## BRAND NEW!

## FUJICA ST 801

## 3 Lens OUTFIT

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## MOVIE MAKING

Continued from page 12

and sort of motioning Karen over when he wanted her to come and he was standing between them...

TG: Like he was the camera?

CH: Well, he was like a conductor, conducting actors at that moment. And he was standing between the two of them. I'm not sure when she knew when to move or anything, but at a certain time when he wanted her to move, John's hand was going like that, and Karen saw it and she moved towards him and then she was into what she did with Homer, on her own. But, suddenly, when Homer reached out for her, for her hand, John broke in and, holding their two hands together, took them and folded them over her breast... then he let go, as she understood what he wanted her to do.

TG: This didn't kill their concentration?

CH: This didn't break up her flow. They were really into it, those characters. They were crying in the rehearsal. Because they had been thinking and doing, planning this, I'm sure, for quite a while. Maybe by themselves. But, at the beginning of the picture, I was not at the rehearsals; nobody was at the rehearsals except John and the actors, the producer... and the AFI (American Film Institute) student. How he got in, I'll never know.

TG: The AFI student?

CH: Yes, the AFI observer.

TG: That reminds me. How does one go about apprenticing to a cinematographer? I don't know if you do it, if you allow it.

CH: Well, I'm not in a position as a cameraman to allow anybody. It's really the director's picture... or the producer's. They have their own AFI guys. I can't say "Well, I know you've got an observer; can I bring in my observer?" You can't have a houseful of observers. It gets tacky, you know, sticky, with that many students around; too many questions being asked. You know, it's not a teaching situation. We're making movies, after all. But, he was a terrific guy, by the way: Harry. And he kind of became the film mascot. John Schlesinger gave him a fantastic opportunity to be in on everything. And he observed me as well as everybody else.

### Why film school?

TG: It seems like a great way to learn, better than going to school. I don't know what your feelings are about that. Is film school necessary?

CH: I think school is necessary. I do. I'll tell you why. Rather than maybe just getting channeled off into something, you learn about writing and about directing and about photography and about editing and about everything that it takes to become a filmmaker. Now if you want to split off and become an editor or a cameraman or an actor, the understanding of all of that in school gives you the opportunity to become a filmmaker. I think the interesting thing about being a director is being a filmmaker, rather than simply a film director who just understands that aspect. And I think the best place to learn it is in school. Because you discuss theory and you get some practical involvement, and that theory is very important along with the practical aspects.

TG: Half the people who write to me want to know where to go: "How do I get started?"

Should I go to school? Which one?" It's sort of endless. Unless you go to each school, you don't know.

CH: It's getting to be mind-boggling. Especially now. There aren't 1,000 people wanting to do it, but 50,000 people wanting to do it. But there are a lot more film schools now than there were then.

TG: It's very confusing. They keep turning out students every year and where do they go? Where do they get work, you know?

CH: Well, it is a dilemma to be turning out so many qualified people when there isn't that much work available. It's a real dilemma, and one that is faced not only by those in it, but by those who can't get in. Someday I think the dam that's been holding people back from opportunities to be in films will break. And it won't be a closed shop anymore.

TG: As far as the union goes?

CH: As far as the union goes. It will still be unionized, but it will be like the Screen Director's Guild where you just have to pay money to join. And you'll have the opportunity to work. Or like the Screen Actors Guild. You can go in and act one picture and then if anybody wants to hire you for another picture, you have to join the union. But at least you can get into the union; at least you get the opportunity.

### What's good photography?

TG: Getting off that subject for a moment, you mentioned something earlier about "slick photography." I'd like to know what "slick" is to you. Gordon Willis once told me he considered it "linoleum color."

CH: Slick photography is the opposite of imperfect photography. It's absolutely beautifully done. For instance, what Alonzo did for *Chinatown* was slick photography. In spite of the fact that he used hand-held shots and everything else like that. But it's very, very beautiful stuff.

TG: Too beautiful?

CH: Well, I think it's beautiful and it fits. But it's not ameliorated, if you know what I mean. It's not screwed-up photography in any way. And... you know, it's hard to define "slick!"

TG: "Classic," in other words.

CH: Classic, classic! Exactly, classic photography, like many of the master photographers in the business did in the early days. They produced a certain kind of look. But it's not bad photography. You look back at those old films and they're beautifully photographed, I think. It's just that, in those days, they used to "slick-photograph" every kind of story, no matter what. And now, the photography adapts more to the material, rather than just being one kind of photography all the time: well lit and beautifully etched and modeled, and this and that, and everything else. It now adapts to the material and changes around and is just as good in one instance as in another. The fact that it serves the story best is what makes it terrific.

TG: Some people say that they can almost pick out a style of cinematography. Do you think that's a little bit in conflict with serving the script, or is it possible to maintain a style and have both?

CH: In relation to that... can I just talk about something, as long as I've got an audience of readers?

TG: Please, feel free.

Continued on page 138



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## MOVIEMAKING

Continued from page 134

CH: I would like to bring up something about Gordon Willis's photography on *Godfather I* and *Godfather II*. We have a thing called the Academy out there and they give a thing called Academy Awards, which are supposed to be for excellence, and sometimes we all wonder whether they are or whether they aren't. Right? And *what is* excellence and *what isn't*? And I was shocked, as were a lot of Hollywood cameramen, by the fact that Gordon Willis was not nominated for either one of those two pictures. Especially since a lot of the public felt they were so good. And then again, for him to be slighted the second time seemed like either there was something collusive going on or there was something really strange going on. Because we couldn't understand why he wasn't nominated. And a lot of us felt badly about it and spoke to him about it. I was very irate, I must say, and I called the Academy and discussed with them how people were nominated, to see if I could figure out why he wasn't even nominated. At the ASC (American Society of Cinematographers) one day, I brought it up to a member, who is a very famous cinematographer, has won many Academy Awards and is a consummate artist, a terrific cinematographer of his day, someone I thought I would get some sympathy from by bringing this up. I suggested to him (because of the travesty of justice) that we get a group together at the ASC and debate what makes good photography. Why somebody thinks that *Earthquake*, which got nominated, is better than *Godfather*. I would have a team of debaters on one side and those who had obviously voted for *Earthquake*, or that style of photography, on the other. This would be a fascinating evening and a way for us members of the ASC to know what each of us thinks about photography, what constitutes good photography in our minds. Well, when I mentioned Gordon Willis's photography to him, he said: "Didn't you hate that photography? Wasn't it awful? I mean, God almighty, you can't see the eyes," you can't see this, you can't see that. He said it was absolutely worthless. And . . . I was in shock!

### Underlit, overlit—but what is style?

TG: This was an old-school cameraman?  
CH: This was very famous cinematographer. He did great work in his time, but he has, obviously, a concept about photography that can't accept another concept. And, I figured, well, my God, maybe this is what's happened to Gordon. O.K., so you can't see the eyes, but does it serve the picture? You can see the eyes sometimes; it's not always that "you can't see the eyes." He shows you the eyes when he wants you to see the eyes.

TG: The characters walk in and out of changing light?

CH: Yes. But this fellow thought that it was bad photography. And it was very, very upsetting, and I still am working to arrange that debate between us. I would be interested for this man to understand more. But maybe we can still bring the two factions together—the modern photographers and the old-time photographers—bring them more together conceptually to talk about what constitutes decent photography. That

when an award is given, it reflects how things are done now rather than how things were done a long time ago.

TG: You and Willis seem to have, maybe not a similar style, but you both achieve very natural-light situations. He goes in one direction and you in another. You seem to overexpose a lot, from what I got the other day in student discussions. And he seems to underexpose.

CH: I do everything. I underexpose a lot, I overexpose a lot. I hope I don't have a style. I mean, is there a style? Can you tell? How can you say *Fat City* and the others are comparable? They're so divergent, and each one has a different photographic style.

TG: Whatever you do, it fits the situation.

CH: That's what I hope to do.

TG: In other words, it's not important for you to have a signature, like: "Oh, that's Gordon Willis" or "That's Haskell Wexler" or "That's Connie Hall."

CH: No. I can tell a Gordon Willis picture sometimes because he does like to light from overhead a lot. Of course, he doesn't always light from overhead. But if the lighting was predominantly overhead, I might suspect it was Gordon Willis . . . But when I think about it, he doesn't really have a style. I've used overhead lighting and so have a lot of others. *Klute* is different from *Godfather*. *Klute* is fantastic. He's just a good cameraman.

### Candlelight—what do you see?

TG: The scene in *Klute* with Jane Fonda sitting at a table. How would you get something like that with one very small light source like a candle on a table?

CH: Well, there are a lot of different ways. You could get a fast lens and fast film and let the candle do it. Or you could have the candle lit and augment the light on the person's face with a light that appears to be coming from the candle. A small spot of some kind. Candle light is usually very sharp. But not all people do it that way, a lot of people just put in a golden haze against a lot of darkness. There's no one way of doing it. There's no one way of painting a picture, or shooting candlelight.

TG: Is there any one film that you like more than others you have worked on?

CH: I'm getting to like all of them the farther away I get from them. I used to hate all of them, hate what I did on the films that I worked on. But, after not having seen them for a long time, and seeing them again. I don't have the same emotional responses and, therefore, I can like them better.

TG: You mentioned something about *Butch Cassidy* once in an article a few years ago to the effect that you overlit the street scenes. It looked beautiful to me, but then I didn't know what you were trying to achieve.

CH: I'm going to see it again, so I'll let you know whether I feel the same way about it. But one thing about me is that I'll say one thing one day and say another thing another day, and I'm actually being honest both times. It's just that I've changed from one time to the next. My opinions about things have changed and they are always changing, and I hope they will always continue to be changing.

(Because of the length of this interview, we shall continue in next month's column, where Conrad Hall gets into specific techniques.)—THE END

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## INSIDE YOUR CAMERA

Continued from page 85

corporate timed speeds from 8 to 1/1000 sec. when set manually. But these speeds aren't mechanically controlled speeds—they are electronically timed (like those provided by the Copal-Square shutter in the Nikkormat EL, for example).

As with other electronically controlled shutter-automated cameras, the K2's ASA-setting dial is not built into the shutter-speed dial. Since shutter-speed settings are ordinarily spaced in full- or half-stop increments, while ASA film speeds normally occur in 1/3 stops, incorporating these two dissimilar systems on the same dial is physically difficult. And so, if you're looking for the ASA-setting control (33), you'll find this heavily knurled black ring located behind the auto-exposure compensation ring (30). We'll explain its operation later.

**9. The meter-coupling bar and gear** are mechanically interconnected and physically turn the meter coil (15) when you switch the camera to manual (match-needle) mode and select a shutter speed. A cam located underneath the board retaining the manual shutter-speed resistors (23) hooks up with the bar and rotates the meter coil, simultaneously setting the green shutter-speed indicator bar in the finder to the shutter speed you select. In this mode, you meter by matching the green bar with the moving meter needle. You control the latter by turning the aperture ring and/or shutter-speed dial until both indicators coincide at the proper exposure setting.

**19. Memory-switch mechanism:** Not surprisingly, many mechanisms built into the latest Pentax K2 are inherited from its predecessors, and this is one of them. The basic function of the memory switch is to retain the exposure reading while the mirror flips, preventing additional light from reaching the meter cells. (An almost exact duplicate of this switch can be found in the May 1974 "Inside Your Camera" report on the Pentax ES II, page 98.) The lever which activates this switch can be seen at the right-hand back section of the mirror box (bottom view). This "slightly-stretched S-shaped" lever moves forward, linking up with the mirror-operating mechanism and cutting off the meter current just before the mirror flips upward. The exposure level is determined by the amount of electric current present in the circuit at the moment of cutoff, and this information is stored in the memory condenser (not shown) located at the bottom of the camera.

**20. f/stop/ASA keying brush:** Here's another very important part of the Pentax family's design heritage. In fact, this small brush is the "gate" through which all lens-aperture and ASA information enters the automatic-exposure system. In most automatic-exposure cameras, lens-aperture information is keyed into the exposure system via a mechanical linkage, while the ASA is fed in electronically. From the very beginning, Asahi determined that electronic keying is the preferred method of communicating all necessary information to the exposure-calculating circuits. In any case, it's certainly more logical than keying in part of the information electronically and the remainder mechanically. Let's journey a little farther inside the K2 and take a look at how it's actually done.



**Two-ring circus:** ASA-keying ring (above) and aperture-keying ring (below) contact each other to transmit single electric signal to K2's exposure-calculating IC's.

Before the aperture is keyed in, this essentially mechanical bit of information has to be converted into an electric signal. And the most common device used to convert mechanical movement into an electric signal is a potentiometer—which is kind of like the rheostat used in the familiar "variable-dimming" light switch. Behind the lens mount are two external rings: the auto-exposure compensation ring (30) and the knurled ASA ring immediately behind it. Each of these external rings turns a ring mounted inside the bayonet-lens-mount unit. (These two inside rings are visible in the picture directly above.) The upper ring is mounted closer to the camera body and keys in the ASA. The bottom one is the aperture-keying ring and it's mounted closer to the lens. On the back of this latter ring is a carbon resistor layer (see the lower arrow in the picture).

The aperture-keying ring is tensioned in a clockwise direction by a long spring (seen here in an upward-stretching position). A prong (32) positioned on this ring contacts the lens-aperture prong (not shown) and turns it counter-clockwise against spring pressure as the lens aperture is stopped down. In the ES II, this ring contacted the aforementioned keying brush (20) directly. But in the K2 this isn't possible, since more information has to be keyed in. This is the function of the second or ASA-keying ring (the upper one), which incorporates a brush which contacts the carbon resistor on the aperture-keying ring, turning clockwise to set progressively higher film speeds. But it also turns when you set the auto-exposure compensation ring (30) to any setting other than 1X (thereby changing the resistance on the lens-aperture keying ring). Finally, there's a contact strip at the back of the ASA-keying ring (also visible in the picture above on the left side top surface of the upper ring). Actually, this strip contacts the f/stop-ASA keying brush inside the camera body and relays all aperture and film-speed information to the exposure-calculating circuit. Two big advantages of this information keying system are: a) it's not necessary to separately key in the maximum aperture of the lens fitted in addition to the working aperture, so a source of error is eliminated and the metering mechanism is actually simplified; and b) unlike most other cameras (including the ES II), a separate potentiometer is not required to key in the ASA. Thus additional error-producing factors are eliminated. Incidentally, Asahi Optical origi-

Continued on page 143



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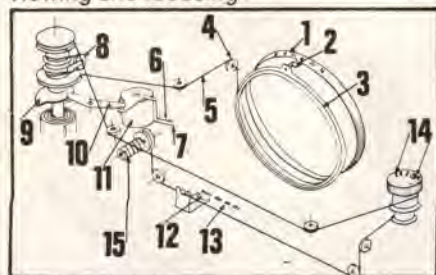
**W**hen Modern Photography's editors first read Gerard Bouhot's massive reports on various SLR cameras, we recognized a first rate technician and photographer who really knew how to wring out a camera completely. Sometimes his findings agreed with Modern Tests and sometimes he went off on flights of praise or damnation of his own.

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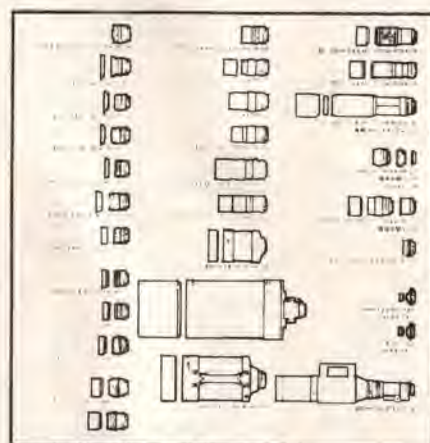
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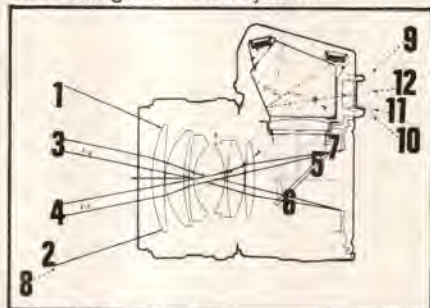
Viewing and focusing



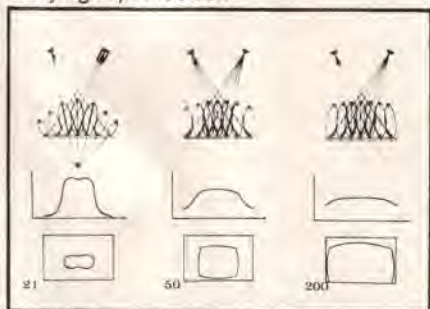
Aperture coupling



Interchangeable lens system

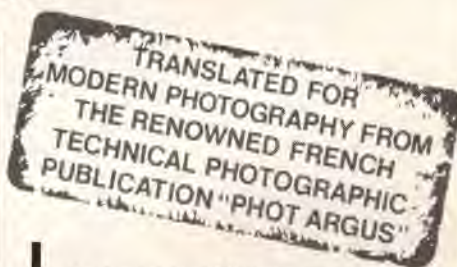


Stray light protection



How the metering system works

**P**lus coupling limits, deliberate double exposures, lens changing, loading and unloading film, depth of field preview, the mirror and baffles, the shutter, flash synchronisation, manual operation.



If you own one of these cameras, these tests will help you get the most from your present system.

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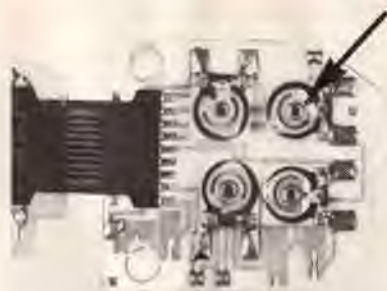
## INSIDE YOUR CAMERA

Continued from page 140

nally developed this aperture-keying concept for their traditional screw-thread-lens-mount cameras, but it works even better with the new bayonet mount since the ASA setting is automatically integrated into the system.

**24. Silicon metering diodes:** In the K2, Asahi finally replaced their well-proven CdS cells and joined the silicon-sensor club. To date, very few cameras have employed silicon cells other than those made by the Sharp Electric Co. In fact, the very first member of the silicon-cell club used Sharp's Silicon Blue Cells (TM), and since that time most silicon cells have been called SBC's. While Pentax's silicon cells are basically quite similar, they're produced by another manufacturer, so Asahi Optical calls them silicon photo diodes (SPD's). Like SBC's, SPD's incorporate blue dichroic filters to adjust their spectral sensitivity for photographic use (by modifying their inherently high sensitivity to infrared light).

**27. Auto-exposure IC board:** Asahi Optical is once again a step ahead of most others by incorporating a plug-in IC board. This method was introduced in 1972 when they marketed the original Pentax ES. The same concept is employed in modified form in the K2's IC board, which plugs into the auto-exposure circuit socket (18) located at the side of the mirror box. It was transferred to this position from its original location at the bottom of the camera (in the ES and ES II) to reduce camera height. One inconvenience resulting from this revised mounting position is the increased difficulty in replacing the IC board in the course of repairs. However, today's IC's are far more stable than those of even a few years ago, so the need for replacing them isn't very likely.



Potentiometer quartet converts mechanical linkage movements into electronic signals which are transmitted to IC's.

just like the ES II's circuit board ("Inside Your Camera," May 1974, page 99).

Let's take a closer look. Affixed to the board are three black boxes (which are called "packages" and protect the IC's mounted inside them) containing separate "monolithic IC's." Since many readers are



Electronics lingo for this IC-protecting "black box" container is "package."

not that familiar with IC's, we'll explain them a bit. Basically, an IC (integrated circuit) is an extremely small structural electronic device in which numerous nonremovable electronic components are "integrated" into a functional unit on a single baseboard. If a large enough number of components are built in, causing the "gate number" (equal to the number of signals the circuit can handle at once) to exceed approximately 100, we normally refer to the circuit as an LSI (large-scale integrated circuit, sometimes abbreviated as LIC). The monolithic IC's in the Pentax K2 belong to this latter category. Monolithic means "one stone" in classical Greek, and this proves to be literally accurate since the entire circuitry of these monolithic IC's is built onto a single crystal of silicon. The picture on the left shows the actual size of a monolithic IC as it passes through the eye of a needle. The maze-like pattern pictured below shows the actual insides of a monolithic IC (similar to the ones

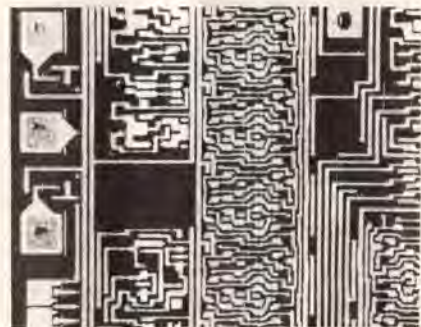
Continued on page 156



IC-threaded needle graphically demonstrates circuit's impressive miniaturization.

Still, IC circuits must be "tuned" to the other electronic circuits controlling shutter-speed selection, shutter-speed timing, metering, etc. Therefore, the adjustment section of the circuit *must* be reached easily. To this vital end, the K2's IC control panel is connected to the IC board by means of a flexible circuit board, and is then attached at the bottom of the camera. Consequently, access for adjustments is possible by simply removing the bottom cover (12).

The K2's control board has four small potentiometers (see picture, above right)



Complex maze of circuitry is evident in this 50X interior shot of typical IC.



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## THE CAMERA COLLECTOR

Continued from page 14

and #14 film-pack Nagels consisted of 2,500 units, and they were the only non-Kodak Nagels to be marketed for two years after the Kodak take-over in 1932. Obviously, then, the #10 is rare, but since it's not in great demand among collectors, its current value is only \$50-75.

Our second camera, however, is both rare and valuable—a true collector's prize. The little pocketable Ranca is a split-frame job, producing 16 1/4 x 1 1/4-in. negs per roll of 127 film. As you may have guessed, this was accomplished by the traditional "two ruby window" method—you placed each frame number in window one and then in window 2. As camera cognoscenti are aware, this format—indeed the Ranca's entire appearance—parallels the much snazzier and jazzier Nagel-Kodak Pupilles, which featured helical focusing, first-rate optics (Tessar, Xenars and Xenons) and Compur shutters. The humbler but much rarer Ranca had none of these things, but its place in history is eloquently attested to by its nameplate, which bears the legend "Kodak-AG Dr. NagelWerk Stuttgart."

You "unfold" your Ranca by grabbing onto a knurled ring and turning it 90° counterclockwise until the helically geared lens tube locked into shooting position. You then focused (3.5 ft. to infinity) by turning the 5cm f/4.5 Nagel Anastigmat's front element. Like the #10 Nagel, the relatively inexpensive Ranca sported a Pronto everset shutter with speeds of 1/25-1/100 sec. plus B and T, but this one was also fitted with a self-timer controlled by a little lever to the right of the shutter-speed wheel.

Two Pupille features shared by the Ranca were its clever lift-out film-holder insert, which was actually integral with the top of the camera body, and its good-quality flip-up finder, an inverted Galilean type. The Ranca originally sold for a hefty \$60.50 and is presently worth about three or four times that—hardly surprising in view of its limited 1932-1934 production run, few of which reached these shores.

Perhaps the supreme achievement of the Nagel factory in the limited-production

designed scale-focusing camera ever to accept 620 roll film." Imagine a range-finderless 6 x 6cm-format creation larger than a Zeiss Super Ikonta B incorporating a unit-focusing (1 meter to infinity) 8cm f/3.5 (to f/22) Schneider Xenar lens in a Compar-Rapid (1-1/400 sec. plus B) shutter, and then shake your head and ask, "Why bother?"

Granted, the huge scissors-type nickel-chrome side struts (plus an additional satin-chrome locating strut on the right-hand side) assured precise lens-to-film-plane alignment, and the automatic film stop (which required that you set number one in the ruby window and then slide its cover closed) was another welcome feature. But since there was never a rangefinder Suprema, it all seems, in retrospect, so much technological overkill.



Conceptually brilliant, the rangefinder Duo lacked the Super Ikonta's rigidity.

Oh well, as a work of art, the Suprema's supremacy has seldom been surpassed. The tooled leather coverings and acres of satin chrome were all in the finest Nagel tradition, and excellent "minor" features abounded. The body shutter release incorporated built-in double-exposure prevention, while the front shutter release didn't; the top plate sported a depth-of-field scale on the left side; a built-in support foot adorned the bottom of the main body section; and the shutter incorporated a built-in self-timer. The minuscule optical viewfinder looked sadly out of place atop this magnificent beast, but it was actually quite a good one. Amazingly, this finder partially nested when you pushed down on it after folding the camera, and automatically popped into viewing position as you pressed the button to open the camera!

The Suprema was produced in very small quantities in 1938, was never imported into the U.S., and is virtually unknown even in Germany. As a consequence, I'd place the value of this near-mint-condition example at about \$300. Incidentally, Nagel finally did get around to producing an equally monumental rangefinder folder, the Kodak Regent, but it wasn't based on the Suprema.

Now that you are thoroughly convinced of the absurdity of the Suprema's "range-finderlessness," let's turn to our final Nagel-Kodak, the rare rangefinder version of the more familiar Duo 620, many of which

Continued on page 148



Overdone? Suprema had more features than any other scale-focusing folder.

field was a camera called, appropriately enough, the Suprema. This meticulously crafted beast deserves another, more dubious title: "The world's most over-



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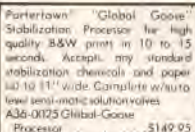
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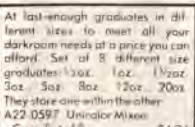
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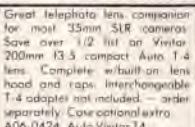
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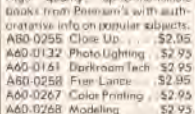
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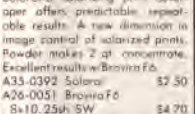
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dust away by compressing bulb.  
Blows hose & blow dust away from  
crucials, behind mirror and from  
camera mechanism. Keep in your  
gadget bag. Give one as a gift.  
A10-0225 Jet Blower  
Brush \$2.59



High quality, up-to-the-minute  
books from Porter's with authori-  
tative information on popular subjects.  
A80-0255 Close Up \$2.05  
A60-0132 Photo Lighting \$2.95  
A60-0161 Darkroom Tech \$2.95  
A60-0258 Five Lenses \$2.95  
A60-0267 Color Printing \$2.95  
A60-0268 Modeling \$2.95



Silver Minimax. Wallet sized  
unlimited metal for silver  
gold prints (gold colorant and  
1 folder included). Size 2"x4".  
Set of 10 with enlarging speed  
emulsion. Use standard chemicals.  
A26-0580 Silver Minimax  
Set 10 Complete \$7.50  
A56-0119 Ten Folders \$5.00



Solenoid enlarging print develop-  
er offers predictable, repro-  
ducible results & a new dimension in  
image control of solenoid prints.  
Powder makes 2" at once.  
Excellent results w/Brown's F6.  
A33-0392 Solenoid  
A26-0551 Brown's F6  
8x10, 25lb SW \$4.70



Right Angle Finder attaches to  
eyepiece of SLR's. Rotates  
360° ideal for copy & close-up.  
A10-0301 Right Angle  
Finder-Minolta \$26.25  
A10-0302 Right Angle  
Finder-Pentax \$26.30  
A10-0303 At Angle Finder  
Nikon, Nikkormat \$26.45



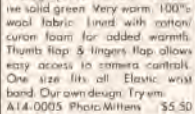
Two fascinating volumes totaling  
390 pages of actual size ad-  
vertisements from the 1880's  
to the 1920's. Reproduced in  
exact detail these ads search  
the past of yesterday's camera  
from the Kodak to the Leica.  
They clearly depict and describe  
early cameras, plates, novelties,  
shutters, accessories and much  
more. Intriguing memorabilia that  
everyone will enjoy.  
A40-0249 Photographer  
Advertising from A to Z  
Volume 1 \$8.95  
A40-0250 More Photo-  
graphic Advertising from  
A to Z, Volume 2 \$8.95



New low price on top quality  
Honeywell Pentax SP 1000  
equipped with 55mm f2.8 Super  
Multi Coated lens. Has the  
fine step-down metering, shutter  
speed 1 to 1/1000 sec., accepts  
universal screw mount lenses.  
Complete with battery, hot  
shoe, card and instruction book. Lens  
accepts 49mm filters, hood, etc.  
CASH PURCHASE REQUIRED.  
A01-0079 Pentax SP 1000  
with 55mm f2.8 SMC  
Takumar lens \$139.95  
A10-0313 Pentax \$139.95  
Cash required \$26.00  
A10-0036 Deluxe Flash  
Clip (optional) \$9.45



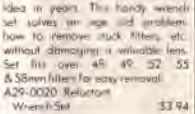
Celebrate your Country's 200th  
Anniversary with a Spirit of '76  
Strip. Features the American  
Eagle & Shield design in silky  
red, white and blue on dark blue  
fabrics background. 2" wide strip  
adhesive to 47" W/O ring tabs.  
A10-0317 Spirit of '76  
Camera Strip \$7.94



Photographers' Minimax. Attract-  
ive solid green vinyl, 100%  
wool fabric lined with cotton/  
curtain foam for added warmth.  
Thumb bar & fingers flap allows  
easy access to camera controls.  
One size fits all. Elastic wool  
band. Our own design. Try us.  
A14-0005 Photo Minimax \$5.50



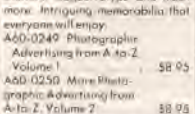
Reluctant Wrench. Set—cleared  
idea in years. This handy wrench  
set solves any age and problem  
how to remove stuck filters, etc.  
without damaging a valuable lens.  
Set fits over 48, 50, 52, 55  
& 58mm filters for easy removal.  
A29-0020 Reluctant  
Wrench Set \$3.94



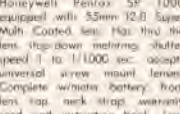
From Vivitar the ideal case for  
photographers on the go. Holds  
SLR with normal lens and two  
accessory lenses plus film.  
A08-0048 Endura Case  
Black \$29.90  
A08-0049 Endura Case  
Black \$29.91  
A08-0050 End Yellow \$29.92  
A08-0051 End Orange \$29.93



Make your own Black & White  
Post Cards. Glossy one side  
and Pastel tint on back. P2  
lens/mount & F3 is included.  
A26-0362 Post Card Paper  
F2 Box 100 sheets \$6.40  
A26-0363 F3 Box 100 sheets \$6.40  
A26-0503 F2 Box 500 \$25.70  
A26-0504 F3 Box 500 \$25.70



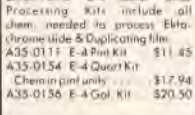
'Light Porter' Complete light-  
ing outfit that is easy to carry  
& pack away. Quilt and sturdy  
carry-all tote case, three 7 foot  
light stands, three 18" reflectors  
with cards and sockets, 3 ball-top  
adapters, & 3 B&A 250w bulbs.  
A45-0119 Light Porter Kit  
Complete \$42.95



Clamp on Diffusion Screen. A  
last resistant plastic material  
that clamps to any minor reflect-  
or. Bend clips for minor adjust-  
ment. Use Great soft lighting.  
A45-0045 Diffusion Screen  
8" Diameter \$6.24  
A45-0046 Diffusion 10" \$6.74  
A45-0047 Diffusion 12" \$8.45



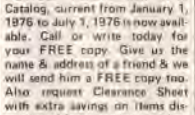
Ektachrome E-4 Color Slide  
Processing. Kits include all  
items needed to process Ektachrome  
slide & duplicating film.  
A35-0111 E-4 Print Kit \$11.45  
A35-0154 E-4 Quat Kit \$12.94  
Chemical print unit \$12.94  
A35-0156 E-4 Kit \$20.50



Agfa Rodinax Developing Tanks.  
Real type tanks may be loaded in  
daylight or darkroom needed. For  
B&W or Color. Use minimum chemi-  
cal. Complete instructions.  
A22-0157 Rodinax 33U  
Tank for 35mm film \$42.95  
A22-0536 Rodinax 60  
Tank for 120 film \$41.50



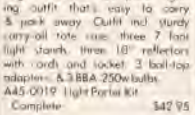
Duplicator. 1:1 saves time and  
money. Duplicate your own slides  
or make negatives. Fits camera  
via adapter sold separately.  
A47-0008 Porter's  
Duplicator 1:1 \$22.75  
A06-0159 Nikon Adapter \$5.93  
A06-0153 Pentax Adapter \$5.90  
A06-0160 Canon Adapter \$5.94



NOTICE! Porter's new K-17  
Catalog, current from January 1,  
1976 to July 1, 1976 is now avail-  
able. Call or write today for  
your FREE copy. Give us your  
name & address of a friend & we  
will send him a FREE copy too.  
Also request Clearance Sheet  
with extra savings on items dis-  
continued from previous catalog.



Make your own Black & White  
Post Cards. Glossy one side  
and Pastel tint on back. P2  
lens/mount & F3 is included.  
A26-0362 Post Card Paper  
F2 Box 100 sheets \$6.40  
A26-0363 F3 Box 100 sheets \$6.40  
A26-0503 F2 Box 500 \$25.70  
A26-0504 F3 Box 500 \$25.70



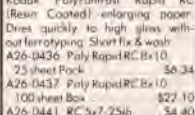
Flo-Temp. Thermometer. Well-  
Accepted standard dial type ther-  
mometer (not included). Measures  
water temperature continuously.  
Screws onto faucet via standard  
pipe thread and fitting.  
A22-0213 Flo-Temp \$14.65  
A22-0087 Dial Thermometer  
for Flo-Temp \$7.88



Linless Gloves. Slip on a pair  
of these lightweight, linless  
gloves and eliminate fingerpad  
damage in the darkroom. Keep  
negatives, lenses, filters, cover  
glass and slides clean. Absorbs  
perspiration. One size fits all.  
A22-0427 Linless Gloves  
Pack of 10 \$4.25



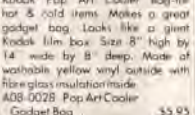
Graphic Easels offer creative  
new opportunities for the dark  
room worker. Fibre board panel  
results in very low price for  
unusual 8x10" effects equals.  
A22-0542 Graphic Easel  
Repeater Model 258 for  
2-3" x 8" \$3.94  
A22-0543 Graphic Easel  
Repeater Model 445 for  
4-4" x 5" \$3.93  
A22-0545 Graphic Easel  
Repeater Model T58 for  
Test Strips \$3.91  
A22-0544 Graphic Easel  
S75 Soft Square \$3.92  
A22-0546 Graphic Easel  
OBS Oval \$3.90  
A22-0547 Graphic Easel  
C75 Circle \$3.89



Kodak Polycontrast Rapid RC  
(Resin Coated) enlarging paper.  
Dries quickly to high gloss with-  
out retyping. Short fix & wash.  
A26-0436 Poly Rapid RC B10,  
25 sheet Pack \$6.34  
A26-0437 Poly Rapid RC B10,  
100 sheet Box \$22.10  
A26-0441 RC 5x7 25lb \$34.40



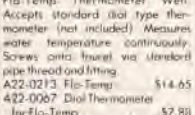
Polycontrast Filters for your  
enlarger. Fit in your color draw-  
er or lay on condenser. Set of  
seven 3" or 6" acetate filters  
green given contrasts from one box  
of paper in 1-2 grade steps.  
A07-0277 Set of Polycontrast  
Filters 3" acetate \$15.75  
A07-0378 Set of 6" Filters \$21.70



Kodak Pop Art Cooler Bag for  
hot & cold items. Makes a great  
gadget bag. Looks like a giant  
Kodak film box. Size 8" high by  
14" wide by 8" deep. Made of  
washable yellow vinyl outside with  
flexible glass insulation inside.  
A08-0028 Pop Art Cooler  
Gadget Bag \$5.95



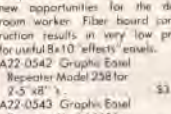
Low cost Fold Away Slide Pages.  
Each 9x11 page holds twenty  
35mm (cardboard mounted) slides.  
These make perfect, fold away  
to fit in your shot pocket or  
A10 envelope for mailing. Trans-  
lucent plastic, 23 pages/pack.  
A35-0118 Camera Fold Away  
Slide Pages PK75 \$3.69



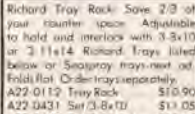
Rubber Eye Cup for your SLR.  
A10-0049 Eye Cup for Pentax  
Mamiya Vivitar \$2.84  
A10-0048 For Minolta \$2.93  
A10-0050 For Nikon \$2.73  
A10-0277 For Miranda \$3.10  
A10-0056 For Canon \$2.98  
A10-0278 For Yashica \$3.20  
A10-0280 For Konica \$3.25



U-spread Photographic Emulsion.  
Print your negatives on the sur-  
face of your choice. Bradi, dry  
or pour on film, wood, metal or  
whatever you choose. Light  
sensitive medium speed continuous  
tone emulsion. With instructions.  
A25-0307 U-Spread  
5oz Emulsion \$8.90



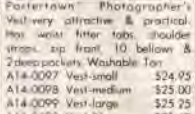
Richard Tray Rack. Save 2/3 of  
your counter space. Adjustable  
to hold and interlocks with 3.5x10  
or 3.11x14 Richard Trays listed  
below or Seagray trays sent out  
Freight flat. Order trays separately.  
A22-0112 Tray Rack \$10.90  
A22-0431 Set 3 3.5x10 \$13.05  
A22-0432 Set 3 3.11x14 \$19.45



Porter's 'Seagray' Print. Prints  
double white plastic is  
acid & stain resistant. Double  
3" bottom ribs for rigidity. For  
Richard Tray Rack Economical.  
A22-0503 Seagray Trays  
Set 3 Size B10 \$5.95  
A22-0504 Seagray Trays  
Set 3 Size 11x14 \$9.95



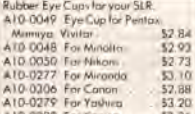
Porter's 'Seagray' Print. Prints  
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Richard Tray Rack Economical.  
A22-0503 Seagray Trays  
Set 3 Size B10 \$5.95  
A22-0504 Seagray Trays  
Set 3 Size 11x14 \$9.95



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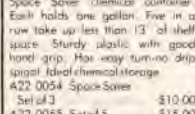
Porter's 'Seagray' Print. Prints  
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Richard Tray Rack Economical.  
A22-0503 Seagray Trays  
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A22-0504 Seagray Trays  
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A22-0503 Seagray Trays  
Set 3 Size B10 \$5.95  
A22-0504 Seagray Trays  
Set 3 Size 11x14 \$9.95



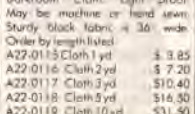
Space Saver chemical container.  
Each holds one gallon. Five in a  
row take up less than 13" of shelf  
space. Sturdy plastic with good  
hand grip. Has easy turn-on drip  
spout. Ideal chemical storage.  
A22-0054 Space Saver  
Set of 3 \$10.00  
A22-0055 Set of 5 \$15.00



1000 rolls of plastic negative  
preserver. Roll cut off to  
any desired length to use as  
for B&W or color. Camera wound  
on a core. Saves you up to 50%.  
A35-0016 Negative Preserver  
35mm 1000 roll \$10.65  
A35-0017 Negative Preserver  
120 size 1000 roll \$14.95



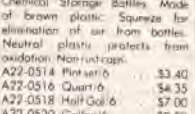
Darkroom Cloth. Light proof.  
May be machine or hand sewn.  
Sturdy black fabric is 36" wide.  
Order by length listed.  
A22-0115 Cloth 1 yd \$3.85  
A22-0116 Cloth 2 yd \$7.20  
A22-0117 Cloth 3 yd \$10.40  
A22-0118 Cloth 5 yd \$16.50  
A22-0119 Cloth 10 yd \$31.50



Brooks/Sigell Portable. Develop-  
ing Tank. Dev & fixer 35mm  
B&W 20 exp. Film without remov-  
ing from cartridge. Single slot  
developer fixer sold separately.  
A22-0223 Brooks/Sigell  
Developing Tank  
A35-0300 Develop/Fixer  
Pack 3 \$1.06



Chemical Storage Bottles. Made  
of brown plastic. Sprays for  
elimination of air from bottles.  
Neutral plastic protects from  
oxidation. Non-radiant.  
A22-0514 Pint size \$3.40  
A22-0516 Quart size \$4.35  
A22-0518 Half Gallon \$7.00  
A22-0520 Gallon \$9.80



Film Identifier. How tell ad-  
dress prints so you can stress in  
your camera in case you  
sticks tight mount film box  
top & bottom using Select-A-  
A10-0200 Film Identifier  
35mm Set 3 \$1.43  
A10-0242 Film Identifier  
120 Set 3 \$1.65



Film Identifier. How tell ad-  
dress prints so you can stress in  
your camera in case you  
sticks tight mount film box  
top & bottom using Select-A-  
A10-0200 Film Identifier  
35mm Set 3 \$1.43  
A10-0242 Film Identifier  
120 Set 3 \$1.65



# ask for it

Got the latest dope on the camera you're interested in buying? Just circle the item number on the coupon and send it to us plus 15c for each item to cover mailing and handling.

## MOVIE EQUIPMENT

- 700.** Specifications for **GAF** movie cameras from a 2:1 zoom ratio up to 10:1 zoom, including giant diagram of ST1002, contained in new brochure.
- 701.** Brochure describes and illustrates **GAF** XL "available light" movie camera line.
- 702.** The **YASHICA** Electro 8 series including the LD-8, LD-6 and LD-4 is described in new brochure.
- 703.** Brochures and price lists including complete information on **BAUER** 16mm sound projectors (Standard), Marc 300, Synchronous and Double Band).
- 705.** **BOLEX** 16mm Product Buying Guide describes motion picture cameras, accessories, and projectors. Technical write-ups on Crystal Sync, Sync Sound production and more.
- 706.** The **GAF** line of dual 8 zoom movie projectors is fully discussed in new booklet.
- 708.** Complete technical data on the **EUMIG** Mark S O&M dual-sound (magnetic and optical) projector contained in new brochure.
- 710.** **EUMIG** Mark 610D film projector for super, single & standard 8 is discussed in new brochure.
- 730.** Brochure on extensive line of **BAUER** super 8 cameras, projectors and accessories. Complete technical specifications included.
- 733.** "Servofocus," **EUMIG'S** recipe for automatically in-focus movies, described in new brochure.
- 736.** Movie cameras and projectors from **ROLLEI** described in technical brochure.
- 738.** Data kit and price list featuring **MINOLTA** XL-400 and XL-250 "low light" super 8 movie cameras and system of accessories.
- 739.** An information kit from **CANON** on its multi-purpose line of movie cameras; auto zoom 814; auto zoom 518 SV; auto zoom 318 M.
- 740.** Data kit includes brochures and price list for the **MINOLTA** Autopak-8 D12 super-8 movie camera and its system of accessories for time lapse and remote photography.
- 741.** The many features of **YASHICA** super 40K-4x auto zoom 8mm camera are discussed in new brochure.
- 742.** Complete line of **EUMIG** cameras and projectors for super, single & standard 8 described and illustrated fully.
- 743.** Complete descriptions and illus-

trations of the **ELMO** line of movie cameras and projectors are contained in new booklet.

- 745.** Fold-out brochure describes "The Total Recall System," a complete home movie outfit provided by **GAF**; each outfit includes camera, projector, film and guidebook.
- 749.** Brochure and price list describe the many professional and versatile features of the **MINOLTA** Autopak-8 D12 super 8 movie camera, including its 12-to-1 macrofocusing zoom lens, lap dissolve and fading features.
- 750.** The full array of advanced features of the **ELMO** super 8 sound 600S is described and illustrated in a new technical brochure.

## 35MM CAMERAS

- 300.** Brochure on all **VIVITAR** 35mm SLR cameras and normal lenses. Outlines the key features of models 220/SL, 250/SL, 420/SL and 450/SLD.
- 301.** Brochure and price list describing **MINOLTA** Pocket Autopak cameras and companion electronic strobe unit in full detail including strobe and  $\approx 110$  cartridge systems.
- 302.** Brochure describes **GAF** line of 35mm cameras: L-ES SLR, L-17 and L-14 SLR, and the compact Memo 35EE rangefinder.
- 303.** Full information brochure on the all-embracing system of the **CANON** F-1 now available.
- 305.** 40-page brochure and price list feature and describe the **MINOLTA** XK, XE-7 and XE-5 electronic 35mm SLR camera system, full line of accessories and Minolta systems of interchangeable lenses from 7.5mm fisheye to 1600mm telephoto.
- 308.** The **LEICAFLEX** is described fully in a colorful 24-page brochure. Detailed information on its lenses and technical specifications is included.
- 309.** **YASHICA** 35 GTN/GSN, described as the world's largest selling 35mm camera is discussed in a colorful brochure.
- 310.** An SLR Kit from **CANON** on its FTb, TLb, and EX Auto.
- 311.** Brochure on the **OLYMPUS** OM-1 35mm SLR system camera, Zuiko interchangeable lenses for the OM-1, plus the motor drive group, close-up, macro, and photomicrography groups and other OM System accessories.
- 315.** **YASHICA** FX-1 and its two systems of interchangeable lenses (both Yashica ML and CONTAX) described in a new brochure.
- 316.** **MIRANDA** 35mm SLR system information kit contains brochure and price list on complete line: Auto-Sensorex EE, Sensorex II, Sensomat RE, lenses, and accessories.
- 317.** Brochure on the "Day 'n' Night" electric eye Canonet by **CANON**.
- 318.** Brochure highlighting the key features of the **VIVITAR** 35CA 35mm compact camera with automatic exposure control and rangefinder focusing.
- 320.** The versatile range of **YASHICA** 35mm rangefinder cameras is colorfully displayed in a new brochure.
- 321.** Information Kit features the **MINOLTA** SR-T system of 35mm SLR photography. Includes brochures and price list on the SR-T 202, SR-T 201, SR-T 200, accessories and lenses.
- 322.** **GAF** pocket camera outfits featuring the 660 and 880 with electronic

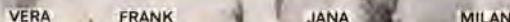
|                                                                                                            |  |     |     |     |     |
|------------------------------------------------------------------------------------------------------------|--|-----|-----|-----|-----|
| <b>To: MODERN PHOTOGRAPHY</b>                                                                              |  | 300 | 301 | 302 | 303 |
| <b>P.O. BOX 2760</b>                                                                                       |  | 305 | 308 | 309 | 310 |
| <b>CLINTON, IOWA 52732</b>                                                                                 |  | 311 | 315 | 316 | 317 |
| Circle the number of the booklets you want and enclose 15c for each to cover handling. (No Stamps, Please) |  | 318 | 320 | 321 | 322 |
| This offer good through Mar. 31, 1976.                                                                     |  | 327 | 329 | 330 | 335 |
|                                                                                                            |  | 336 | 339 | 341 | 343 |
|                                                                                                            |  | 355 | 361 | 363 | 365 |
|                                                                                                            |  | 377 | 379 | 380 | 700 |
|                                                                                                            |  | 701 | 702 | 703 | 705 |
| NAME _____ (Please Print)                                                                                  |  | 706 | 708 | 710 | 730 |
|                                                                                                            |  | 733 | 736 | 738 | 739 |
| ADDRESS _____                                                                                              |  | 740 | 741 | 742 | 743 |
|                                                                                                            |  | 745 | 749 | 750 | 801 |
| CITY _____                                                                                                 |  | 802 | 805 | 806 | 809 |
|                                                                                                            |  | 823 | 840 | 842 | 845 |
| STATE _____                                                                                                |  | 846 | 847 | 850 | 851 |
|                                                                                                            |  | 860 | 861 | 862 | 864 |
| ZIP _____                                                                                                  |  |     |     |     |     |

shutters and strobes described in new brochure.

- 327.** Data kit covers **MINOLTA** 35mm automatic cameras. Brochures feature the Hi-matic E, Hi-matic F and Hi-matic G cameras.
- 329.** Booklet describing the **OLYMPUS** 35RC, 35ED and 35DC automatic compact cameras with rangefinder focusing.
- 330.** The **ROLLEIFLEX** SL35, the 24x36mm SLR camera with HFT lenses, outlined in brochure with complete technical data.
- 335.** The **ROLLEI** 35, a precision miniature camera, described in new booklet.
- 336.** Fact Sheet on 140° **WIDELUX** F7 Super 35 extreme wide field camera includes its description and uses.
- 339.** The **YASHICA** TL Electro-X and its system of interchangeable lenses and accessories are discussed and illustrated.
- 341.** Brochure on the **VIVITAR** 402 Point-n Shoot camera, and the 602 Point-n Shoot camera with built-in electronic flash.
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- 377.** Features and specifications for **BELL & HOWELL'S** SLR model FD35 discussed in fact sheet. Also interchangeable lenses for FD35 cameras.
- 379.** "Read what the press of the world says about the Fujica ST801 camera" is the theme of a new booklet from **FUJI**, containing various test reports and articles.
- 380.** Brochure describes the **MINOLTA** XK electronic 35mm SLR system, full line of accessories, and Rokkor-X system of interchangeable lenses.
- 801.** Fact sheet from **BELL & HOWELL** on its line of electronic flash units, with complete specifications.
- 802.** "Toshiba—the right light automatically" is the theme of a new brochure from **ELMO**. The ES System of these electronic flash units is described fully.
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- 806.** "Compact sunshine" is the theme of a booklet from **ROLLEI** describing its complete line of precision flash units.
- 809.** Pamphlet on **SOLIGOR** spot sensor includes data and price information.
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- 842.** Information on **SOLIGOR** exposure meters including complete technical information and prices.
- 845.** **MINOLTA** Auto Electroflash 450 and Auto Electroflash 280, brochure and price list detailing operation of these high-power, auto-exposure, electronic flash units and accessories.
- 846.** The **HONEYWELL** Pentax 1°/2° exposure meter is discussed in a handy new brochure.
- 847.** Tripods, camera cases, and accessories for the creative photography are discussed in a brochure from **SAMIGON**.
- 850.** "Add sound to your slide shows" is the theme of a new brochure on the **TIFFEN** Show/ Corder, for synchronized sound slide shows.
- 851.** Information kit from **SAMIGON** electronic flash; camera cases; tripods; bellows extension; slide duplicator; special effects attachments for SLR.
- 853.** **NOVOFLEX** fact sheets describing line of lenses, adapters, components, and additional accessories.
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- 860.** Technical booklet explains **MINOLTA'S** line of professional exposure meters. Including the Auto-Spot 1°, Auto-Spot 1° TV, Flashmeter and Autometer Professional.
- 861.** A variety of photographic accessories from **RITZ** is illustrated and discussed in new technical booklet.
- 862.** Available from **BOGEN** is a brochure on the Bowen's Macro-Lite, the high intensity electronic flash lighting system for close-up and photomacrography.
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## THE CAMERA COLLECTOR

Continued from page 144

found their way into the U.S. Like the scale-focusing Duo 620, this one produced 16 1/8 x 2 1/4-in. images per roll of 620 film and had a unit-focusing 7.5cm f/3.5 (to f/22), Kodak Anastigmat lens (a Tessar type) mounted in a Compur-Rapid (1-1/500 sec. plus B) shutter. Its automatic film-stop system was similar to the Suprema's, though this much smaller camera lacked the latter's front shutter release and its special knob atop the camera for resetting the automatic film counter.

Of course, these minor lacks were more than offset by the Duo's combined, coupled, superimposed-image rangefinder, which was nice and contrasty and accurate down to its 4-ft. minimum distance.

Although beautifully finished in the Nagel tradition, this camera suffered from the same disease (in milder form) that afflicted its scale-focusing counterpart—its side bracing was not the most rigid in the world (though it was somewhat better than many other folders). Still, in terms of overall construction, metallurgy and design, you'd have to rank it as one of the finest folding roll-film rangefinder cameras ever made, a worthy, if less famous, rival of the Zeiss Super Ikonta A. What's Kowalak's slightly marred rangefinder Duo worth? Well, he says he wouldn't sell it for under a grand, but I think I'll test his mettle by offering him a fast \$200.—THE END

## INSTANT PICTURES

Continued from page 50

Colorpacks used the eye to compute flash exposures for a single aperture.)

To the more knowledgeable photographer, this development can mean new on-camera electronic flash units such as the ITT Magicflash, because the eye can read the high-output, short-duration flashes and mechanically close the shutter to accommodate them. This was why my off-camera flash pictures, triggered by a flashbulb, were successful, and it makes possible new techniques for directional lighting.

A dead FlashBar, with all its bulbs burned out, will still cause an image to appear, but only if there is enough light in the scene to make an exposure at the particular flash setting at which you are focused. While this may suggest some technique for taking advantage of the small flash aperture and its depth of field, there must be enough bright daylight to make the exposure. Your composition will be limited to the distance for that aperture.

In my outdoor experiment, described earlier, I learned to make the settings for a fill flash. But, to make it work, you must cover the eye to blind the system from the daylight. Since the eye would see no light, it would create an overexposure as it did in the picture on page 50, but moving the Lighten/Darken control completely to "darken" brings it back to combine daylight with shadowless flash.

This single development—an innovation in a unique exposure system—brings with it the promise of new techniques, applications and products to explore, while continuing what, three years ago, was the most radical new concept in the photographic world.—THE END

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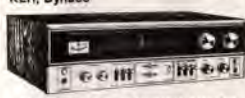


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| Super Color Pack Kit (N) | 30.00  |
| SX 7011 (N)              | 79.00  |
| SX 7011 Improved (N)     | 102.00 |
| SX 70 Improved           | 129.00 |

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# BEHIND THE SCENES

Continued from page 126

## Those elusive Series 1's

When is the oft-reported but still unavailable Vivitar Series 1 lens trio—the 600mm f/8 Solid Catadioptric, 90mm f/2.5 macro and 28mm f/1.9—finally going to make its debut? "Soon," says P&B.



In the flesh at last: 600mm f/8 on camera, 90mm f/2.5 with adapter, 28mm f/1.9.

The earliest scheduled arrival is to be the "limited-production" 600mm Solid Cat, a nine-element, seven-group design measuring 3 5/16 in. in length and weighing in at 3 lb. on the nose. Americans will have to wait until "late spring or early summer of this year" for the other lenses, but at least they're destined for "large-quantity production" according to P&B. Particularly interesting is the eight-element, seven-group 90mm f/2.5 macro which is furnished with a three-element, three-group field-flattening "macro adapter," taking the lens from 1:2 down to 1:1. Of course, the floating-front-group nine-element 28mm f/1.9 is no technological slouch either.

All members of this innovative optical act are expected to debut in Nikon, Canon, Minolta, Konica Autoreflex and Olympus OM-1 mounts, with "more to come." However, prices are "still being formulated."

## Minolta 110 SLR will be first

The Minolta 110 pocket-sized SLR (complete with a 2:1 ratio zoom lens that sticks slightly out of the camera front) will make its debut at the PMA (Photographic Marketers Assoc.) trade show in Chicago next month—at least that's Minolta's plan at the moment. Price: about \$250.

## 50mm f/1 lens for Leica M's

While we have had a 50mm f/0.95 Canon lens for the late-lamented Canon 7S rangefinder camera, the remaining manufacturer of 35mm rangefinder cameras, E. Leitz, hadn't seen fit to go beyond the 50mm f/1.2 Noctilux. But now we have a Canadian-designed and produced 50mm f/1 Noctilux from Leitz with nary an aspheric surface in sight. That's a full half-stop faster than the f/1.2, and amazingly it's about \$400 cheaper than the \$1,240 Wetzlar (Germany)-made Noctilux at \$855. Still the questions remain as to whether it's worth all that extra loot over the one-stop-slower 50mm f/1.4 Summilux, or it furnishes image quality on a par with the super-costly 50mm f/1.2. Tune in to "Modern Tests" next month, where we hope to have a full report.

## 70mm back for RB67

Have you always wanted a 70mm bulk film back for your Mamiya 6 x 7 reflex? It's on the way?—THE END

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## LATEST CANON SALE

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| EF 1.8                     | 329.00 |
| EF 1.4                     | 369.00 |
| FTBN 1.8 SC                | 208.00 |
| FTBN 1.4 SSC               | 239.00 |
| FI 1.8 SC                  | 385.00 |
| FI 1.4 SC                  | 420.00 |
| FTBN Body                  | 159.00 |
| 1014 Movie Camera          | 449.00 |
| 814 AUTO Zoom w/c & Remote | 283.00 |
| MF Motor Drive             | 365.00 |
| 512 XL                     | 233.00 |
| 110 ED                     | 103.00 |
| TX 1.8 w/c                 | 163.00 |
| 514 XL                     | 198.00 |

## PRICE BREAK MINOLTA

|                          |        |
|--------------------------|--------|
| SRT-101 NEW              |        |
| "M" TAG 2 YEAR GUARANTEE |        |
| F1.7 MC Rokkor           | 189.00 |
| F1.4 MC Rokkor           | 216.00 |
| SRT 100 F2 w/c           | 165.00 |

## LATEST SRT 202 SALE

|              |        |
|--------------|--------|
| 50/1.7       | 245.00 |
| 50/1.4       | 269.00 |
| 50/1.2       | 355.00 |
| SRT 101 Body | 139.00 |
| ORIG. CASE   | 16.00  |

## PROJECTORS AND SOUND CAMERAS

|                                                                                 |                   |
|---------------------------------------------------------------------------------|-------------------|
| GAF 250 XL                                                                      | 209.95            |
| Automatic level control, reflex viewing, earphone power zoom, backlight control |                   |
| GAF 3000S                                                                       | 193.00            |
| GAF Sound                                                                       | 605.              |
| 2500S Zoom Proj                                                                 | 259.95 805 279.95 |
|                                                                                 | 150.00            |

## MAMIYA RB-67 PRO-S

|                                             |        |
|---------------------------------------------|--------|
| 90/2.8 Mamiya, 120-Roll Holder, W.L. Finder | 625.00 |
| 50/4.5 Mamiya Lens                          | 410.00 |
| 65/4.5 Mamiya Lens                          | 319.00 |
| 250/4.5 Mamiya Lens                         | 360.00 |
| 360/6.3 Mamiya Lens                         | 385.00 |
| Mamiya C330 F w/80                          | 355.00 |
| Bronica S2A w/75 Nikkor only                | 360.00 |
| Bronica ECTL                                | 590.00 |

## Nikon

YOU GET WHAT YOU PAY FOR!

|                                 |        |
|---------------------------------|--------|
| Nikon F2 Body                   | 315.00 |
| Nikon F2 Photomic               | 359.00 |
| Nikon F2S Photomic              | 440.00 |
| For Black, add.                 | 14.00  |
| Nikkormat FT2                   | 156.00 |
| Nikkormat FT2 BL                | 166.00 |
| Nikkormat EL                    | 265.00 |
| 50mm F2 Nikkor I.C.             | 69.00  |
| 50mm F1.4 Nikkor I.C.           | 133.00 |
| 55mm F1.2 Nikkor I.C.           | 184.00 |
| 15mm F5.6 Nikkor I.C.           | 879.50 |
| 20mm F4 Auto Nikkor I.C.        | 249.00 |
| 24mm F2.8 Nikkor I.C.           | 176.00 |
| 28mm F2 Nikkor I.C.             | 277.00 |
| 35mm F2.8 Auto Nikkor I.C.      | 123.00 |
| 35mm F2 Nikkor I.C.             | 173.00 |
| 35mm F1.4 Nikkor I.C.           | 296.00 |
| 45mm F2.8 GN Auto Nikk I.C.     | 90.00  |
| 55mm F3.5 Micro New P.K. 3 I.C. | 178.00 |
| 85mm F1.8 Nikkor I.C.           | 184.00 |
| 105mm F2.5 Nikkor I.C.          | 184.00 |
| 105 F4 Auto Micro w/ PN-1       | 354.00 |
| 135mm F3.5 Auto Nikk I.C.       | 138.00 |
| 135mm F2.8 Nikkor I.C.          | 177.00 |
| 180mm F2.8 Auto Nikk            | 369.00 |
| 200mm F4 Nikkor I.C.            | 184.00 |
| 300mm F4.5 Auto Nikk I.C.       | 299.00 |
| 500mm F8 Reflex Nikk I.C.       | 370.50 |
| 16mm F3.5 Nikkor                | 359.00 |
| 28-45 F4.5 Zoom I.C. Nikkor     | 425.00 |
| 43-86 I.C. Nikk Zoom            | 175.00 |
| 80-200 F4.5 I.C. Nikk           | 425.00 |
| F2 Motor Drive                  | 509.00 |
| Nikon R-10 Macro                | 619.00 |
| NEW Nikones III w/35 f2.5       | 265.00 |

## Rollei A26 Camera w/C26 Auto Electronic Flash

**\$93.50**  
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## COMPACT CAMERAS

|                       |        |
|-----------------------|--------|
| Olympus 35RC Kit      | 94.50  |
| Miranda Sensitive w/c | 68.00  |
| Rollei 35 Black       | 109.00 |
| Rollei A110           | 195.00 |
| Canon QL17 w/c        | 97.00  |
| Minolta Hi Matic F    | 75.00  |
| Rollei 35 S 2.8       | 133.00 |



## JUST ARRIVED NEW OM-1 MOTOR DRIVE MODEL

|                 |        |
|-----------------|--------|
| OM-1 MD 1.8     | 249.00 |
| OM-1 MD 1.4     | 286.00 |
| OM-1 MD 1.2     | 348.00 |
| Body only       | 195.00 |
| for Black add   | 16.00  |
| 24mm 2.8 Zuiko  | 170.00 |
| 28mm 3.5 Zuiko  | 135.00 |
| 35mm 2.8 Zuiko  | 95.00  |
| 100mm 2.8 Zuiko | 139.00 |
| 135mm 2.8 Zuiko | 158.00 |
| 50mm 3.5 Macro  | 170.00 |
| 75-150mm        | 236.00 |

## VIVITAR STROBES

|     |       |     |       |
|-----|-------|-----|-------|
| 352 | 47.00 | 253 | 28.00 |
| 273 | 53.00 | 292 | 86.00 |
| 202 | 19.95 | 283 | 75.50 |

## CALCULATORS

|                              |        |
|------------------------------|--------|
| With Case, Battery & Charger |        |
| TEXAS INSTRUMENTS            |        |
| SR10                         | 28.00  |
| SR51A                        | 108.00 |
| SR50A                        | 76.00  |
| TI5050                       | 112.00 |
| Keystone #2030               | 29.00  |
| TI 1200                      | 14.50  |
| SR 16 II                     | 43.00  |

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|                            |        |
|----------------------------|--------|
| Durst F30 w/50mm           | 61.00  |
| Durst F60 w/50mm           | 69.00  |
| Durst M301 w/50mm          | 82.00  |
| Durst A 300 w/Lens         | 198.00 |
| Durst M601 w/50mm          | 139.00 |
| CLS Color head for M301    | 126.00 |
| CLS 66 Color head for M601 | 165.00 |
| Beseler 23 CII             | 155.00 |
| 50mm F4 El Nikkor          | 35.00  |
| Minolta Moduler III        | 189.00 |

## PETRI FT EE

|                             |        |
|-----------------------------|--------|
| w/1.8 Auto EE Petri w/Case  | 138.00 |
| PETRI FTX w/1.8 Auto w/case | 119.00 |
| Petri ES AUTO w/case        | 84.95  |

## MINOLTA XL-400 movie camera

|                               |  |
|-------------------------------|--|
| dramatic close-up movies.     |  |
| push-button power zooming     |  |
| Built-in time lapse           |  |
| tully automatic electric eye  |  |
| micro-motor film drive        |  |
| <b>\$159.95</b> LTD. Quantity |  |

## VIVITAR POCKET KODAK POCKET

|     |       |        |       |
|-----|-------|--------|-------|
| 602 | 43.00 | 608    | 29.00 |
| 600 | 33.00 |        |       |
| 402 | 19.00 | Pocket |       |
| 604 | 53.00 | Strobe | 14.95 |

## MINOLTA CELTIC LENSES

|                     |        |
|---------------------|--------|
| 28mm 2.8            | 73.00  |
| 35mm 2.8            | 53.00  |
| 135mm 3.5           | 53.00  |
| 135mm F2.8          | 70.00  |
| 200mm F4            | 80.00  |
| 100-200mm F5.6      | 118.00 |
| 50mm F3.5 Macro     | 99.00  |
| Minolta XL 400 only | 159.95 |
| Minolta Autopak 70  | 43.00  |
| Autopak 50          | 36.00  |
| Minolta HiMatic E   | 96.00  |

## CELTIC BINOCULARS

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| 6x20  | 53.00 |
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## VIVITAR FIXED MOUNTS LENS SPECIAL

|                       |        |
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| 28mm F2.5             | 74.00  |
| 35/1.9                | 64.00  |
| 35/2.8                | 55.00  |
| 55mm F2.8 Macro       | 99.00  |
| 100/2.8               | 49.00  |
| 135/2.8               | 59.00  |
| 200/3.5               | 68.00  |
| 85-205/3.8-MACRO zoom | 149.00 |
| 75-260 F4.5           | 139.00 |
| 400-5.6               | 135.00 |

For OM Canon, Nikon Mounts Add \$5.

## VIVITAR SERIES I VMC

|             |          |
|-------------|----------|
| 70-210      | \$269.99 |
| 35-85 MACRO | \$285.00 |

## HONEYWELL PENTAX CAMERA & FLASHES

|                             |          |
|-----------------------------|----------|
| PENTAX Spotmatic F 1.8 SMCT | \$199.00 |
| 1.4 SMCT F                  | \$233.50 |
| Pentax ES II, f2 SMCT       | 299.00   |
| Case, \$15.00; Orig. Case   | 22.00    |
| SP 1000/F.2                 | 148.00   |

## PRO 6x7 SYSTEM

|           |        |           |        |
|-----------|--------|-----------|--------|
| Body      | 419.00 | TTL Prism | 249.00 |
| Col. Hood | 49.00  | Grip      | 50.00  |
| 55mm      | 398.00 | 75mm      | 232.00 |
| 105mm     | 278.00 | 150mm     | 262.00 |

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| 480S      | 80.00 | 890S        | 125.00 |
| 470       | 84.25 | 892S        | 125.00 |
| Slave 200 | 50.00 | Pre Pack II | 18.00  |
| Slave 202 | 62.00 | Per Set     | 72.00  |
| Slave 204 | 99.00 | STR-Eye     | 19.25  |
| B.C.C.    | 12.00 | Domes       | 10.00  |

## KONICA



## AUTOREFLEX T3

|                       |          |
|-----------------------|----------|
| 1.7                   | 259.50   |
| 1.4                   | 298.00   |
| Black body add        | 15.00    |
| w/ Split-Image Finder | add 5.00 |
| Konica A3W 1.7        | 193.00   |

## HEXANON LENSES

|                        |        |          |        |
|------------------------|--------|----------|--------|
| 24/28                  | 167.50 | 100/2.8  | 127.75 |
| 28/3.5                 | 119.25 | 135/3.2  | 69.50  |
| 35/2.8                 | 106.25 | 50 Macro | 165.50 |
| 38-100/2.8 Zoom        | 399.75 |          |        |
| 65-135/4.2 Zoom        | 189.75 |          |        |
| 80-200/3.5 Zoom        | 260.00 |          |        |
| Konica S3              | 132.00 |          |        |
| C-35 Compact with case | 79.00  |          |        |
| SUNPAK 511             | 82.00  |          |        |

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| Miranda Sensorex               |       |       |
| Sensomat & EE                  | 19.50 | 25.00 |
| Canon FT & FTB                 | 19.50 | 24.95 |
| Konica Auto                    | 21.00 | 26.00 |
| Petri II & EE                  | 19.50 |       |
| Pentax ES                      | 23.50 | 28.95 |
| Olympus OM-1                   | 23.50 | 28.95 |

## Miranda specials

|                        |        |
|------------------------|--------|
| Miranda DX3 1.8        | 259.00 |
| Miranda DX3 1.4        | 289.00 |
| Sensorex II 1.8        | 148.00 |
| Sensorex EE 1.8        | 169.00 |
| Miranda RE II 1.8      | 165.00 |
| Auto Miranda EE lenses |        |
| 80-200 EC              | 195.00 |
| 28mm 2.8 EC            | 119.00 |
| DX3 Case               | 15.00  |

## FLASH SALE

|                 |        |
|-----------------|--------|
| Metz 402        | 175.00 |
| Metz 218        | 92.00  |
| Ascorlight 1600 | 195.00 |
| Rollei 140 RES. | 95.00  |
| Bauer E 25A     | 45.00  |

## VIVITAR AUTO TX LENSES

|                                                                    |        |                |        |
|--------------------------------------------------------------------|--------|----------------|--------|
| for all Cameras including Pentax ES,<br>Olympus OM and Minolta XK. |        |                |        |
| 24 f2.8 .....                                                      | 82.50  | 200 f3.5 ..... | 75.50  |
| 28 f2.5 .....                                                      | 74.50  | 300 f5.6 ..... | 82.50  |
| 35 f2.5 .....                                                      | 59.50  | 400 f5.6 ..... | 129.50 |
| 135 f2.5 .....                                                     | 59.50  |                |        |
| 90-230mm f/4.5 Zoom .....                                          | 124.50 |                |        |
| 75-260mm f/4.5 Zoom .....                                          | 147.00 |                |        |
| TX lens mount adapter .....                                        | 13.95  |                |        |

## NEW SIGMA MULTI COATED

|                                                                                                             |        |
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| Lens with EPOI 3 year Guarantee Automatic Lenses. For Pentax ES, Nikon, Canon, Minolta, Olympus and Konica. |        |
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| 18mm F3.2 .....                                                                                             | 139.00 |
| 55mm F2.8 Macro .....                                                                                       | 97.95  |
| 100mm F2.8 Macro .....                                                                                      | 116.00 |
| 135mm F1.8 .....                                                                                            | 134.50 |
| 135mm F2.8 Macro System                                                                                     |        |
| Focusing .....                                                                                              | 93.95  |
| 200mm F2.8 Macro System                                                                                     |        |
| Focusing .....                                                                                              | 158.95 |
| 200mm F4 Macro System                                                                                       |        |
| Focusing .....                                                                                              | 108.00 |
| 300mm F4 Macro System                                                                                       |        |
| Focusing .....                                                                                              | 156.00 |
| 500mm F8 Mirror Lens .....                                                                                  | 129.00 |
| 80-200mm F3.5 Macro                                                                                         |        |
| System Zoom .....                                                                                           | 195.00 |



## MINOLTA XK

### PRICES SLASHED

| Prices slashed on all XK Cameras<br>and Rokkor-X Lenses |        |
|---------------------------------------------------------|--------|
| XK & AE Finder F1.7                                     | 369.00 |
| XK & AE Finder F1.4                                     | 400.00 |
| XK & AE Finder F1.2                                     | 510.00 |
| XK Body & AE Finder                                     | 325.00 |
| Minolta XK Case                                         | 28.76  |
| NEW XE-7 AUTOMATIC                                      |        |
| Minolta XE-7 F1.7                                       | 340.00 |
| Minolta XE-7 F1.4                                       | 375.00 |
| Minolta XE-7 F1.2                                       | 460.00 |
| XE-7 Body                                               | 288.00 |
| XE-5 Body                                               | 239.00 |
| XE-5 1.7                                                | 275.00 |
| Minolta XE-7 Case                                       | 22.76  |
| ROKKOR-X LENSES                                         |        |
| 24mm f2.8                                               | 138.00 |
| 28mm F2.5                                               | 137.00 |
| 28mm F3.5                                               | 105.00 |
| 35mm F2.8                                               | 76.00  |
| 55mm F1.7                                               | 159.00 |
| 135mm F2.8                                              | 109.00 |
| 200mm F3.5                                              | 153.00 |
| 300mm F4.5                                              | 224.00 |
| Macro 50mm F3.5                                         | 146.00 |
| 80-200 Zoom                                             | 340.00 |
| 100 Macro                                               | 245.00 |

## YASHICA CAMERAS

(All Still Include Case)

|                   |            |
|-------------------|------------|
| Electro 35 GTS    | 115.95     |
| Electro 35 GSN    | 88.99      |
| Electro AX F1.7   | 158.00     |
| Electro AX F1.4   | 209.00     |
| TL Electro-X F1.7 | 170.00     |
| TL Electro-X F1.4 | 195.00     |
| TL Electro F1.9   | 158.00     |
| Yashica Mat 124 G | 112.00     |
| W.A. or Tele      | 29.00 ea.  |
| Yashica FX-1      | Low Prices |

## SONY T.V. SPECIALS

|          |        |          |        |
|----------|--------|----------|--------|
| TC 110 B | 84.95  | KV 1510  | 335.00 |
| KV 1520R | 379.00 | KV 1711  | 380.00 |
| KV 1722  | 392.50 | KV 1730R | 426.00 |
| KV 1920  | 435.00 | KV 1930R | 410.00 |

## COMPACT SONY TC 55

Only \$114.00

## Vivitar

TRIPODS

|            |       |            |       |
|------------|-------|------------|-------|
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| Model 99   | 21.95 | Model 122  | 22.95 |
| Model 1200 | 27.95 | Model 1220 | 29.95 |
| Model 1240 | 37.95 | Model 1241 | 44.95 |
| Model 1301 | 59.95 | Model 1321 | 74.95 |

## EXPOSURE METERS

|                            |        |
|----------------------------|--------|
| Gossen Luna Pro w/cs.      | 78.95  |
| Variable att. for Luna Pro | 22.95  |
| GOSSEN Super Pilot w/case  | 53.76  |
| VIVITAR #43                | 19.95  |
| GOSSEN Pilot-2 w/case      | 31.76  |
| GOSSEN C-MATE CDS w/cs     | 37.76  |
| GOSSEN-ASCOR FLASH         |        |
| METER WITH CASE            | 196.76 |
| Minolta Auto Spot 1" w/cs  | 299.99 |
| Autometer Pro Spot KH      | 99.99  |
| Minolta Flash Meter        | 188.75 |

## NEW PENTAX K SERIES

|          |        |          |        |
|----------|--------|----------|--------|
| KM Body  | 150.00 | KX Body  | 194.00 |
| K2 Body  | 285.00 | KM w 1.8 | 225.00 |
| KM w 1.4 | 260.00 | KM w 1.2 | 340.00 |
| KX w 1.8 | 254.00 | KX w 1.4 | 300.00 |
| KX w 1.2 | 360.00 | K2 w 1.8 | 360.00 |
| K2 w 1.4 | 400.00 | K2 w 1.2 | 460.00 |

## PENTAX LEATHER CASE

|         |       |
|---------|-------|
| KM & KX | 20.00 |
| K2      | 26.00 |

## PENTAX SMCT LENS

|           | Thread | Bayonet |
|-----------|--------|---------|
| 15mm      | 479.50 | 499.50  |
| 17mm      | 186.50 | 196.50  |
| 20mm      | 169.50 | 189.50  |
| 24mm      | 148.50 | 157.50  |
| 28mm      | 108.50 | 114.50  |
| 35 F2     | 145.50 | 155.50  |
| 35 F3.5   | 79.95  | 89.50   |
| 50 Macro  | 104.50 | 119.50  |
| 100 Macro | 146.50 | 159.50  |
| 85        | 149.50 | 154.50  |
| 105       | 109.50 | 119.50  |
| 120       | 120.50 | 129.50  |
| 135 3.5   | 99.50  | 117.50  |
| 135 2.5   | 139.50 | 139.50  |
| 150       | 120.50 | 122.50  |
| 200       | 134.50 | 145.50  |
| 300       | 249.50 | 259.50  |
| 45-125    | 357.50 | 289.50  |
| 85-210    | 305.50 | 319.50  |

## FILTERS HIGH QUALITY BRANDS FILTERS

| mm. | Price | Polarizing | Price | Color | FLB   | Close-Up Set | #1, #2, #3 |
|-----|-------|------------|-------|-------|-------|--------------|------------|
| 48  | 3.00  | 7.00       | 4.3   | 7.72  | 10.95 |              |            |
| 49  | 3.00  | 7.25       | 4.50  | 8.00  | 10.95 |              |            |
| 52  | 3.15  | 7.90       | 5.18  | 8.00  | 13.95 |              |            |
| 55  | 3.55  | 8.40       | 6.33  | 9.10  | 12.90 |              |            |
| 58  | 3.95  | 8.90       | 6.90  | 10.00 | 12.00 |              |            |
| 62  | 5.25  | 9.75       | 7.90  | 11.50 | 14.95 |              |            |
| 67  | 5.70  | 14.00      | 8.50  | 15.00 | 18.95 |              |            |
| 72  | 8.30  | 15.00      | 10.00 | 16.90 | —     |              |            |
| 77  | 10.50 | 18.80      | 11.00 | 22.50 | —     |              |            |
| 82  | 14.00 | 21.50      | 14.75 | 28.00 | —     |              |            |

## Kodak FILM SPECIALS

|                                         |      |
|-----------------------------------------|------|
| Factory packed                          |      |
| Fresh Dated                             |      |
| With processing by Kodak                |      |
| Minimum order 10 rolls (could be mixed) |      |
| AGFA 84 135/36                          | 3.95 |
| Fuji R 100/36                           | 3.65 |
| KR or KM 135/36                         | 4.75 |
| KA464 Super 8                           | 4.49 |
| K459 Reg. 8 Daylight                    | 4.29 |
| Ektachrome Super 8                      | 4.55 |
| Ektachrome Super 8 160                  | 4.95 |
| Kodachrome Sound                        | 5.65 |
| Ektachrome Sound                        | 6.15 |
| CPS 135/36                              | 2.29 |
| CX 135/20                               | 1.49 |
| CPS 120                                 | 1.29 |
| EX 135/20                               | 1.65 |
| VPS 135/20                              | 1.69 |
| EX 135/36                               | 2.35 |
| VPS 135/36                              | 2.29 |
| EH 135/20                               | 1.95 |
| CX 135/36                               | 1.95 |
| EH 135/36                               | 2.89 |
| GAF 500 20 Exp                          | 2.98 |

## KODAK PREPAID MAILERS

|                            |      |          |      |
|----------------------------|------|----------|------|
| DP 20-3R                   | 5.49 | DP 36-3R | 9.59 |
| DP 20-2R                   | 4.65 | DP 36-2R | 8.29 |
| PK-20                      | 2.05 |          |      |
| PK-36 Slides               | 3.15 |          |      |
| PK-59 for 8 or Super 8     | 2.15 |          |      |
| PK-27 for 127, 130 and 620 | 2.45 |          |      |



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SLIDE CUBE  
PROJECTOR

109<sup>00</sup>

|                          |        |
|--------------------------|--------|
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| Bell & Howell 1623Z      | 106.00 |
| Bell & Howell 987        | 87.95  |
| Kinderman 2 1/2 Proj.    | 115.00 |
| Kodak 600H 2.8 Lens      | 76.95  |
| Kodak 650H 2.8 Lens      | 94.50  |
| Kodak 750H 2.8 Lens      | 109.95 |
| Kodak 760H 2.8 Lens      | 132.50 |
| Kodak 850H Custom w/lens | 173.95 |
| Kodak 860H Custom w/lens | 189.95 |
| For Zoom Lens add        | 20.00  |
| Kodak Stack Loader       | 12.95  |
| Minolta AFT/2 Auto Focus | 102.00 |
| Elmo 600S                | 259.00 |
| Bell-Howell 1216         | 118.00 |

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| Bauer Top Star XL | 89.00  |
| Gralab Timer      | 27.00  |
| Polaroid SX 70    | 118.00 |
| Polaroid SX 70 II | 98.00  |

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|         |        |
|---------|--------|
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| 801 1.4 | 235.00 |
| 901-1.8 | 299.00 |
| 901-1.4 | 325.00 |

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|-------------------|--------|
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| MSX 500 w/50 2    | 119.00 |
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| 45-150/3.5 Macro Zoom       | 248.50 |
| 70-210/3.5 Macro Zoom       | 225.00 |
| 70-220/3.5 Macro Zoom       | 248.50 |
| 80-200/3.5 Zoom MC          | 145.00 |
| 100-300/5 Macro Zoom        | 238.00 |

## TECHNIQUES TOMORROW

Continued from page 64

Biogon lenses, but other aberrations in the Russinow lens caused poorer image quality, and the Biogon won out as the wide-angle lens of that period.

The modern inverted-telephoto designs for wide-angle lenses, called the retro-focus type, also have strong negative elements far out in front of the diaphragm. As you may suspect, these designs do overcome the cosine-fourth loss. If you have a 28mm or shorter focal length wide-angle lens for an SLR, pick it up and look at the brightly-lit white paper through the front element. Now stop the lens down about two stops. When you turn the lens so that the entrance pupil (white circle) appears to travel toward the edge of the front element, you can see how the size of the pupil increases. In the case of super-wide lenses—20mm and shorter—this growth is very obvious.

In spite of the advantages of modern computers and the new, higher index of refraction glasses, many high-speed and telephoto lenses are allowed to cut off a bit of the off-axis beam to avoid letting in light which is badly aberrated. This falloff is called vignetting, and lens designers today use it to avoid almost impossible design problems for off-axis images.

MODERN PHOTOGRAPHY's laboratory staff has been concerned about the light falloff in lenses due to the cosine-fourth law and to vignetting in the lens design. To determine how these losses affect a picture might require nothing more than taking a picture, of a very evenly illuminated wall with a low-contrast film, such as Eastman Kodak's Panatomic-X. The developed negative would then be measured with a densitometer to determine the loss of exposure toward the edges and corners of the film format. However, there are problems with accurate control of the development and the resulting contrast factor, or gamma, of the film. This results in less accuracy.

So we developed a scanning photocell setup instead, which produces a direct recording of the exposure (illumination on the flat film) falloff. This, coupled with a visual inspection of the shape of the entrance or exit pupils for off-axis angles, will enable MODERN's staff to get very accurate and sensitive measurements of this characteristic of today's lenses. A more complete report of our first tests with this new equipment is given in the article on page 88. As new lenses come along, this additional data will appear as part of the more detailed tests now being printed in our "Modern Tests" section (see page 104).—THE END

## ED SCULLY ON COLOR

Continued from page 32

gest that the problem will be in interested and intelligent hands.

My next column on this subject may originate from the Annual Conference of the Society For Photographic Education to be held in Minneapolis, Minn. on March 17-21. I will chair a panel including some of the same people who met at IMP, and we will exchange views with those who are currently teaching photography, mainly on college campuses. I'll report on what happens and hope it is another chapter in an increasingly interesting story.—THE END

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## INSIDE YOUR CAMERA

*Continued from page 143*

used in the Pentax K2) reproduced at about 50X magnification.

The electronic components contained in the "maze" are designed on many sheets of acetate, photographically reduced and then printed onto the silicon crystal. This "printing" process involves the successive masking of sections of the silicon crystal to prevent chemical action where it isn't wanted, and treating the other sections with a succession of various chemicals to form silicon-based transistors or capacitors purely by chemical action. The masks must be changed up to six or seven times to produce the requisite components on the face of the silicon crystal.

### Sophisticated computations

Each circuit is so tiny that one thinly sliced silicon crystal disc of about 2 to 3 in. in diameter can accommodate approximately 500 to 600 IC's in actual production. This disc, which is called a wafer, is then cut into individual circuits which are sealed in air-tight packages to protect the tiny, extremely sensitive IC's. Do you have any idea how many individual calculations are handled by the K2's three IC's in the course of arriving at the proper exposure? When subject brightness information enters via the meter sensors (SPD's), the information must be converted into exposure (or f/stop) values. The calculation used in this conversion is called logarithmic compression. Then, after combining ASA-setting inputs and lens-aperture information, the actual exposure calculation begins. In fact, the computations continue until the instant before the mirror flips, at which point the three IC's "memorize" the electronic code for the metered light value.

Finally, the result of the calculations has to be interpreted back into normal arithmetic values (in order to count the exposure time in sec.) even before the first and second shutter curtains physically time the exposure. These processes, all of which involve highly sophisticated mathematical formulas, are accomplished instantaneously by these tiny IC's.

But even in the midst of this electronic wizardry, don't lose sight of the fact that the actual power to operate the K2's camera mechanism is derived from mechanical springs, and not from electronic devices. In short, even at the advanced stage of camera design represented by the Pentax K2, the "all-electric" camera still looms, ever more tantalizingly, in the future.—HIROSHI KIMATA & JASON SCHNEIDER

## Got a "Blankety-Blank Corner" in your camera?? Find out how he and 87 friends got there and what to do about them.



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### Oops!

In our Dec. 1975 "47 Top Cameras" report on the Minolta SR-T 202, pg. 123, paragraph five begins: "Minolta provides two normal lenses for the 202 (and other Minoltas) . . ." As can plainly be seen in our bold-type introductory specs, however, three lenses are mentioned: the 50mm f/1.7 MC Rokkor-X, 50mm f/1.4 and 58mm f/1.2 MC Rokkor-X lenses. In our zealous rush to get this last-minute camera entry in the magazine, we slighted the 58mm f/1.2 in the text. All we can say is: Please believe the bold face—there are indeed three normal lenses for the 202.





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## HOW TO GO SLOW

Continued from page 77

bracket like crazy, burn lots of film and bow six times toward Mecca.

On the other hand, if you're willing to experiment and let the results fall where they may (they could be breathtaking), there's no big problem. Swing the camera over your shoulder with the shutter on "bulb," if the spirit moves you. But before we send you off with your curtains open, let's examine the basic notions of "slow-shutterdom."

Blur is the most common manifestation of a slow-shutter exposure. Part of the picture may be blurred, contrasting the moving subject with the immobile (see Bob Gelberg's photo of a marching band on page 78, or Joel Sternfeld's confirmation tableau on page 79), or the entire frame can be a wash of abstracted color forms, as in Tomas Sennett's panned shot of a woman racing for a train (pg. 76-77). But there are other ways to slow-shutter success besides blur, as Erich Hartmann's neon light painting (page 79) shows. While Hartmann used an auxiliary shutter of his own design to get the effect of multiple pinpoints of light, most SLR users could get similar results with separate exposures, either using a built-in multi-exposure provision or the "hang-onto-the-rewind-knob" method.

As far as problems go, most are easily solved. Consider, for example, that with Tri-X on a sunny day you're not going to be able to show much motion because of the high shutter speeds required (unless your subject is terrifically fast). The answer, of course, is to switch to a slower film. What if Panatomic-X or Kodachrome 25 are still too speedy for your taste? Then you're forced to use neutral-density filters, which come in a variety of f-stop reducing grades. (ND-1 means one stop less light, ND-2 two stops, etc.) Color rendition isn't affected.

More complicated is the question of reciprocity correction for long exposures, or for open flash exposures with automatic flash units in which the flash duration commonly gets as short as 1/50,000 sec. or less. In either case, exposure changes and color shifts come into play. To cope, you'll need to start with manufacturer-supplied corrections for the film you're using. At right, in table form, are the recommended corrections for reciprocity characteristics of Kodak, GAF and Fuji slide films (we could get only these time corrections for Agfa-chrome: to 1 sec., no change; at 10 sec., + 1/2 stop; at 100 sec., + 1 stop).

### What about black and white?

Color shifts are of no concern with black-and-white films, naturally, but at the extremes of long and short exposure you should compensate. Kodak's recommendations for all its popular b&w 35mm and roll films are given in terms of aperture and development changes. This country's other major b&w marketer, Ilford, supplies its data for long exposures in terms of adjusted shutter speeds. We've listed figures on FP4 (ASA 125) and HP4 (ASA 400) for long exposures. For speeds between 1/2 and 1/1000 sec., no adjustment is called for with either Ilford film. At 1/10,000 sec., the shortest time it has data for, Ilford recommends a 1/2-stop increase.

Like we said before, there's no Golden Rule we can give you for getting great slow-

## RECIPROCITY CORRECTIONS

Here are the exposure and filter changes you should use for very long and short speeds (see text for details).

### Kodak Color Slide Films

| Exposure (in sec.) | K24                 | K64                 | Ekt.-X                | H.S. Ekt.                 |
|--------------------|---------------------|---------------------|-----------------------|---------------------------|
| 1/50,000           | —                   | —                   | none<br>no filter     | none<br>no filter         |
| 1/25,000           | —                   | —                   | none<br>no filter     | none<br>no filter         |
| 1/1000             | + 1/2 stop<br>CC10C | + 1/2 stop<br>CC05C | none<br>no filter     | none<br>no filter         |
| 1/100-<br>1/10     | none<br>no filter   | none<br>no filter   | none<br>no filter     | none<br>no filter         |
| 1                  | + 1/2 stop<br>CC10R | + 1/2 stop<br>CC10R | + 1 stop<br>no filter | + 1 stop<br>no filter     |
| 10                 | N.R.                | N.R.                | + 2 stops<br>CC15Y    | + 1 1/2 stop<br>no filter |
| 100                | N.R.                | N.R.                | N.R.                  | N.R.                      |

### GAF and Fuji Color Slide Films

| Exposure (in sec.) | GAF 64              | GAF 200                          | GAF 500                          | Fuji-chrome         |
|--------------------|---------------------|----------------------------------|----------------------------------|---------------------|
| 1/50,000           | + 1/2 stop<br>CC15Y | + 1/2 stop<br>CC075Y<br>+ CC075R | + 1/2 stop<br>CC075Y<br>+ CC075R | —                   |
| 1/25,000           | + 1/2 stop<br>CC15Y | + 1/2 stop<br>CC10R              | + 1/2 stop<br>CC10Y              | —                   |
| 1/1,000            | none<br>no filter   | none<br>no filter                | none<br>no filter                | none<br>no filter   |
| 1/100-<br>1/10     | none<br>no filter   | none<br>no filter                | none<br>no filter                | none<br>no filter   |
| 1                  | none<br>no filter   | none<br>no filter                | none<br>no filter                | + 1/2 stop<br>CC05C |
| 10                 | + 1/2 stop<br>CC10Y | + 1/2 stop<br>CC10Y              | + 1/2 stop<br>CC10Y              | + 1 stop<br>CC10C   |
| 100                | + 1 stop<br>CC20Y   | + 1 stop<br>CC20Y                | + 1 stop<br>CC20Y                | + 2 stops<br>CC20C  |

### Kodak Black-and-White Films

| Exposure (in seconds) | Aperture change | Development change (time) |
|-----------------------|-----------------|---------------------------|
| 1/100,000             | + 1 stop        | + 20 percent              |
| 1/10,000              | + 1/2 stop      | + 15                      |
| 1/1000                | none            | + 10                      |
| 1/100                 | none            | none                      |
| 1/10                  | none            | none                      |
| 1                     | + 1 stop        | - 10 percent              |
| 10                    | + 2 stops       | - 20 percent              |
| 100                   | + 3 stops       | - 30 percent              |

### Ilford Black-and-White Films

| Indicated setting | Adjusted setting (sec.) |      |
|-------------------|-------------------------|------|
|                   | FP4                     | HP4  |
| 1 sec.            | 1.2                     | 1.1  |
| 2                 | 2.6                     | 2.5  |
| 8                 | 14.5                    | 13.0 |
| 64                | 205                     | 190  |
| 128               | 498                     | 488  |

"—" = no data given; "N.R." = not recommended

shutter pictures. The best we can do is supply some common everyday examples, such as a person running or the flow of wine into a wineglass (see page 81). Nor are we saying that a blurred picture is better than a sharp, motionless picture. But after examining the photographs we've shown you, we think you'll have to admit that sometimes the tortoise can beat the hare.

—ANDY GRUNDBERG







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# Now the most versatile medium-format SLR yet. The Mamiya RB67 Pro-S.

Single-lens reflex photography doesn't end with 35mm, it just begins. Today, larger format SLR's can take you beyond the creative limits of 35mm, or even  $2\frac{1}{4} \times 2\frac{1}{4}$ .

Choosing the right medium-format SLR can be complicated unless you know what to expect. Here's help. Mamiya is a leader in bringing more versatility to this professional format.

**The  $2\frac{1}{4} \times 2\frac{3}{4}$  format: a lot more to work with.**

Some medium-format SLR's limit you to the  $2\frac{1}{4}$  square negative. Not so with the Mamiya RB67 Pro-S.

The  $2\frac{1}{4} \times 2\frac{3}{4}$  (6x7cm) format of the Mamiya RB67 Pro-S has long been considered ideal for professional photography. It can be enlarged to the most popular print sizes, 4x5, 8x10 or 16x20, with virtually no cropping. Using the entire negative helps assure sharper large-size prints.



enough to be cropped for sharp, high-quality prints, makes retouching easier and can be viewed without magnification.



When making an 8x10 print, for example, the 6x7cm negative offers over 50% more usable area than  $2\frac{1}{4}$  square and over four times that of 35mm. And, the 6x7cm negative is large

**What to look for in a medium-format SLR.** A medium-format SLR with interchangeable film backs widens your options because you can use 120 or 220 roll film, Polaroid®, plus sheet and pack film. And change from one to the other in mid-roll.

The Mamiya RB67 Pro-S has these interchangeable backs. And, as an added convenience, the entire film back revolves. This revolving back allows full use of the 6x7cm format vertically or horizontally with a simple

turn of the wrist while the camera stays upright. Automatic format indication assures correct framing when the back is horizontal.

Of course, you'll want the versatility of interchangeable lenses. A new line

of multi-coated lenses are available for the RB67 Pro-S. These superb lenses have exceptional resolution and are available in a wide range of focal lengths from the 50mm super wide-angle to the 360mm long telephoto.

To complete this professional system, the RB67 Pro-S has a wide variety of interchangeable finder screens and finders.

**Mamiya's exciting RB67 Pro-S has it all—Plus.**

The Mamiya RB67 Pro-S has many new features for faster, easier photography not found on other medium-format SLR's or older models of the RB67.

These include a built-in double exposure prevention with defeat capability, shutter interlocks to prevent accidental misfiring, accessory shoe, single-action focusing hood with brighter finder image, and a focusing knob lock lever.

Plus, the added flexibility of a built-in bellows that lets you move right in for close-ups, and auto extension tubes for extreme close-ups.

**Price/Value: Mamiya means more for the money.**

If you think all medium-format SLR's have huge price tags, you're in for a surprise. The Mamiya RB67 Pro-S gives you all these superb professional features at a surprisingly reasonable price.

For complete details on the Mamiya RB67 Pro-S system, send in the coupon below.

Or, stop in at your local camera outlet for a "hands-on" demonstration of the RB67. Once you see it in action, we're betting you'll pick Mamiya.

**BHMC**

**BELL & HOWELL/MAMIYA COMPANY**  
**Photography's first family.**

Please send me complete details on the Mamiya RB67 Pro-S system.

Len La Bonar Dept. MP-68-4  
Bell & Howell/Mamiya Company  
2201 W. Howard St., Evanston, Illinois 60202

Name \_\_\_\_\_

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City \_\_\_\_\_

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**Photograph the excitement of the Bicentennial.**

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Beauty.  
With  
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performance.



Form follows function. So before we made Kodak Carousel custom H projectors beautiful, we put the emphasis on performance.

With such time-proven, dependable features as gentle gravity-feed operation, which is as simple as an apple falling off a tree.

They're also whisper-quiet. With a lamp that's easy to change. And with features such as automatic focusing and timing, remote control, and brightness control from which to choose.

And all 2 x 2 Kodak Carousel projectors now have as standard the curved-field Kodak projection Ektanar C lens. It's designed to give improved edge-to-edge projection sharpness by compensating for film curvature that occurs in cardboard- and plastic-mounted slides. The 102 mm (4") f/2.8 version is standard. Other curved-field and flat-field lenses are optional.

The Kodak Carousel custom 840H projector shown, which includes the 102 mm f/2.8 Ektanar C lens, is priced at less than \$227. Other models start at less than \$85.

Our point: There's far more to Kodak Carousel custom H projectors than meets the eye. And, if you're as fussy about the quality of your slide projector as you are about the quality of your slides, they're worth looking into. Check all the features at your photo dealer's.

**Kodak Carousel custom H projectors**  
More than a pretty face.

Prices are subject to change without notice.

